NATIONAL ENDOWMENT FOR THE Humanities

DIVISION OF **PRESERVATION AND ACCESS**

Narrative Section of a Successful Application

The attached document contains the grant narrative and selected portions of a previously funded grant application. It is not intended to serve as a model, but to give you a sense of how a successful application may be crafted. Every successful application is different, and each applicant is urged to prepare a proposal that reflects its unique project and aspirations. Prospective applicants should consult the NEH Division of Preservation and Access application guidelines at http://www.neh.gov/grants/preservation/humanities-collections-and-reference-resources for instructions. Applicants are also strongly encouraged to consult with the NEH Division of Preservation and Access staff well before a grant deadline.

Note: The attachment only contains the grant narrative and selected portions, not the entire funded application. In addition, certain portions may have been redacted to protect the privacy interests of an individual and/or to protect confidential commercial and financial information and/or to protect copyrighted materials.

Project Title: Providing Global Access to Penn's Indic Manuscripts, circa 1527-1930 (bulk 1700-1850)

Institution: University of Pennsylvania

Project Director: Nancy M. Shawcross

Grant Program: Humanities Collections and Reference Resources

Providing Global Access to Penn's Indic Manuscripts, circa 1527-1930 (bulk 1700-1850)

NARRATIVE

Significance

Objective: With the largest collection of Indic manuscripts in North America, the University of Pennsylvania Libraries propose to catalog and create digital facsimiles for all of its holdings. The images will be available to view, download, and harvest--free of charge, under a Creative Commons license--via the website, *Penn in Hand: Selected Manuscripts*. The project will provide more accurate metadata--which can be openly harvested and downloaded as XML files--than is contained in H. I. Poleman's 1938 publication, *A Census of Indic Manuscripts in the United States and Canada*, and will offer more access points--such as genres, uniform titles, subjects, and scribes--for researchers looking for relevant material. In addition, the names of authors and titles will be entered in their original scripts, making this Philadelphia-based collection a truly international resource.

***Collection background*:** As early as the 1880s Sanskrit was taught at the University of Pennsylvania by Morton W. Easton, Professor of Comparative Philology. Upon Easton's retirement in 1912, the Sanskrit scholar Franklin Edgerton was appointed. W. Norman Brown, who replaced Edgerton in 1926, was responsible for the acquisition of the preponderance of Penn's Indic manuscript collection; Brown's concerted efforts to promote the study of India and the surrounding region culminated in the establishment of the first academic department in the United States devoted to South Asia Studies. By the time Poleman was compiling his census in the 1930s, Penn already owned nearly 3,000 items.

Avatars of Vishnu, 1800s. Palm-leaf manuscript praising and illustrating the major avatāras of the Hindu deity Viṣṇu, including Kṛṣṇa and Rāma, focusing on their defeat of various demons.

Brown had a deliberate plan to develop Penn's archive; he sought a collection of texts that would evenly represent the traditional areas of knowledge: the Vedas, epics, Purāṇas, religious texts, literature (poetry, prose, and drama), poetics, philosophy, grammar and linguistics, law and politics, mathematics, astronomy and astrology, and medicine. Because Brown bought complete family libraries, Penn's holdings reflect the broad subject range that he deemed essential for a manuscript collection. In the penultimate decade of British rule in India, civil unrest, labor strikes, and public boycotts throughout the country often made travel hazardous. Brown's agent and former teacher, Narayana Shastri Khiste (a Maharashtrian brahman from Benares), mentioned the turbulent times in his correspondence with Brown, but it was precisely because of these unsettled conditions that families with manuscripts frequently preferred to sell them for fear of losing them altogether to theft or destruction. Penn, therefore, acquired a manuscript collection remarkable in its scope, depth, and quality, preserving them for future readers.

Brown's selections contain numerous recensions of important texts, as well as other unique material. The coherence, documentation, and breadth of the collection make it a valuable tool in understanding the historiography of Indic paleography. The manuscripts helped to shape a full generation of researchers, particularly when used by educators like Brown to train his students. The collection offers an intellectual map of American scholarship in the areas of Sanskrit and greater South Asia Studies.

Penn's collection is a preeminent American resource for studying the history of ancient and medieval scribal and literary traditions of South and Southeast Asia (see Appendix C, "Letters of Support"). All of the texts represented by this collection have been mediated through a variety of physical formats that say much about the manner, history, transmission, and usage of a given work. Such formats include palm-leaf manuscripts that are small enough to be cupped in one hand by a priest or doctor who relied on them daily--items meant to be carried close to the body and consulted in private. Other manuscripts come in the form of long rolls (one as long as fifty feet) and were designed to be shown and discussed at public events. Many paper manuscripts show the telltale signs of use, with the oils and dirt of many hands--transferred during consultation over centuries--retained on their surface, pointing to the significance of specific sections or parts of texts to a broader community; in some cases the obsessive endeavors of a single reader are revealed through reflections in marginal notes. Such material aspects, unique to individual manuscripts, offer more research data than printed editions; centuries-old manuscripts challenge our understanding of texts as static or fixed entities.

Collection overview: Penn's Indic collection comprises more than 3,000 discrete items dating from 1527 to 1930; the bulk derives from 1700 to 1850. The majority are loose, foliated works, most written on paper, with some written on palm-leaf. Also found are six rolls, two dozen diagrams, a score of codices, and 150 individual fragments. The primary language of the manuscripts is Sanskrit, but approximately ten percent of the works are written in regional languages, such as Hindi, Marathi, Awadhi, Nepali, Braj, classical Tamil, Prakrit, and Pali. About 2,900 manuscripts were included in *A Census of Indic Manuscripts in the United States and Canada*, a catalog compiled by H. I. Poleman and published in 1938 by the American Oriental Society. This initial cataloging process helped to organize most of the collection into key subject headings, which are relevant to the study of Sanskrit and Indian religion, especially Hinduism.

18th-century miniature painting from Bikaner, Rajasthan, depicting the Hindu deities Gaṇeśa, the elephant-headed, lord of beginnings, and his brother Skanda-Kārttikeya, along with their animal vehicles (peacock and mouse).

The Poleman catalog has been the primary face of Penn's collection of manuscripts outside of the University of Pennsylvania, even into the digital age. While it has remained a valuable guide to researchers, it nonetheless contains numerous inaccuracies and omissions. All the information it provides about the manuscripts (including titles, authors, dates, language, scripts, etc.) needs updating, correcting, and clarification for a more accessible and useable catalog to be maintained. In the 1990s a pilot cataloging project for the Indic manuscripts was initiated: we attempted to use graduate students to enter data from the Poleman census into a MARC-based electronic catalog. The work force was difficult to maintain, and the project was abandoned. We realized that we needed a dedicated cataloger not simply to transcribe metadata from the 1938 published catalog but also to re-examine and re-describe the items.

In 2011 we reviewed our cataloging practices, changed our protocol for Indic manuscripts, and hired a cataloger fluent in Sanskrit. The current cataloger, Benjamin Fleming, holds a doctorate in religious studies and has recently been awarded a research grant under the Endangered Archives Programme, administered by the British Library, to be part of an international team of scholars to create an inventory of the approximately 6,000 Sanskrit, Bengali, and Prakrit manuscripts held at the Ramamālā Library, Bangladesh. At Penn Fleming prepares original cataloging records: he consults the Poleman census but also retrieves the manuscript and fully examines it. The records currently being produced

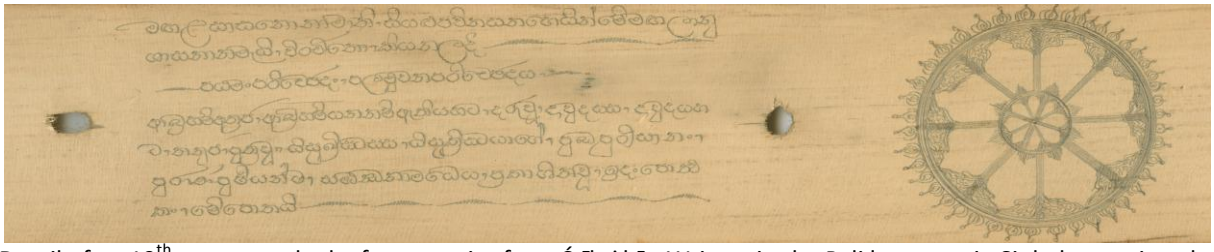
include details not found in Poleman's entries, such as manuscript colophons, vernacular script titles, and subject and genre headings. As of 1 July 2013, one third of Penn's Indic manuscripts have been cataloged in OCLC and downloaded to Penn's online catalog, Franklin, as well as the website *Penn in Hand*. By the proposed start-date of 1 July 2014, we anticipate the completion of forty-five percent of the collection; during the course of the thirty-month grant, the remainder of the manuscripts will be cataloged.

Physical condition ranges from very good to poor with the majority in the "good" range. Given the use of digital cameras (rather than flatbed scanners), Penn does not anticipate rejecting any items for photography. If there are items in need of attention prior to shooting, they will be treated by the library's full-time conservation specialist. As the manuscripts have been cataloged, the condition of the items has been reviewed and a report entered in the holdings field. We estimate less than five per cent of the collection needing paper repair prior to shooting.

By definition, all items digitized in this project are unique and do not duplicate the holdings of any other repository. With that said, the digitization of Penn's late Mughal-era to early-modern Indic manuscripts offers an abundance of opportunities for resource sharing. By making facsimiles of Penn's manuscripts freely available over the Internet, scholars and librarians will be able to collate and compare similar manuscript texts and the handwriting and scribal practices they evince. In addition, the cataloging metadata in Franklin and in *Penn in Hand* can be immediately downloaded as XML files by scholars and digital resource aggregators--an enhancement soon to be available in both Franklin and *Penn in Hand.* Also under development is the mechanism for scholars and aggregators to download directly from the website 600-dpi TIFF files of images. With a Creative Commons license, the high-resolution files will be directly harvestable through *Penn in Hand* by the end of the proposed project (i.e., by December 2016).

One example of a repository that would benefit from Penn's proposal is the Sanskrit Library. It was created through collaboration with the Thesaurus Indogermanischer Text- und Sprachmaterialien (TITUS) at Johann Wolfgang Goethe Universität, Frankfurt am Main, the Cologne Digital Sanskrit Lexicon (CDSL) project at Universität zu Köln, and the Vedic Reserve at Maharishi University of Management and now includes images for approximately 150 of Penn's Indic manuscripts. The facsimiles were produced for a 2008 NEH-funded project, directed by Peter M. Scharf. He consulted manuscripts related to two titles, the Mahābhārata and the Bhāgavatapurāṇa. The Sanskrit Library provides access to specific passages on particular pages in manuscript images by aligning them with digital texts and by providing a comprehensive hypertext catalog that includes incipits, explicits, rubrics, colophons, notes, and other descriptive parameters. Recently the Sanskrit Library has undertaken several new projects, such as cataloging all the Sanskrit manuscripts in the Houghton Library at Harvard University as the first phase of a larger project to catalog, digitize, and integrate them with corresponding digital texts in the Sanskrit Library. At the conclusion of this grant, if awarded, Penn's collection--even larger in number than Harvard's--will be immediately available--free of charge--to the Sanskrit Library in terms of metadata **and** in terms of digital facsimiles. The Penn Libraries and the Sanskrit Library have a history of cooperative resource sharing, which would be further enhanced by the proposed project.

It should also be emphasized that Penn's collection and its proposal will offer a wider range of material than what comprises the scope of the Sanskrit Library. As George Hart, professor emeritus at the University of California, recently noted: "'Indic' and 'Sanskrit' are not synonyms. Materials in



Detail of an 19th-century palm leaf manuscript from Śrīlaṅkā. Written in the Pali language in Sinhalese script, the text is a Buddhist retelling of the life of Jesus.

Tamil, Telugu and other languages are as important for Indic studies--even premodern Indic studies--as those in Sanskrit." Penn's collection includes texts in classical Tamil and Telugu as well as other languages and, thus, will be able to service a greater range of Indic scholars and digital resource aggregators than the Sanskrit Library.

Other recently announced projects related to Indic manuscripts include a digitization effort at Cambridge University (England) for its collection of 2,000 items and the formation in 2003 of the National Mission for Manuscripts in India. The latter was established "to unearth and preserve the vast manuscript wealth of India." In his blog South Asia scholar Dominik Wujastyk suggested that the crowdsourcing of manuscript transcription holds "great promise for the Indian case. . . . Imagine the scenario of an open, public, collaborative website where anybody can bring up an image of a Sanskrit manuscript and write a transcription in an adjacent window. A transcription that - like a Wikipedia article - would be open for others to improve or annotate, that would rely on crowdsourced cognitive surplus for contribution and gradual quality improvement. It would be under a history/version control system, so everything would be trackable. Contributors would earn trust points or, as in eBay's feedback score."

The Rare Book & Manuscript Library's collection of Indic manuscripts is shelved on site in closed, alarmed stacks. All paper-based items are housed in custom-made, archival-quality, four-flap enclosures, which are placed in archival-quality folders and boxes. The manuscripts are available for consultation by any researcher who shows current photographic identification, registers, and completes a manuscript application form. The Penn Libraries provide free, online access to the digital materials created in house, including the facsimiles produced through this project. Approximately 2,850 manuscripts will be digitized during the thirty-month grant period, adding to the approximately 200 already digitized and available on *Penn in Hand.*

Penn in Hand: Selected Manuscripts: Hosted and maintained by the University of Pennsylvania Libraries, *Penn in Hand* (http://dla.library.upenn.edu/dla/medren/) went live in the fall of 2009. At that time it was perceived as a delivery system simply for the digital facsimiles of Penn's medieval and Renaissance manuscripts, but in 2010 it became an all-purpose website for the presentation of any digitized manuscript in the Rare Book & Manuscript Library. In late 2011 the curator of manuscripts was contacted by the university archivist and head of Archives and Special Collections at Arizona State University Libraries. A professor at the Department of Indology and Tibetology at the University of Marburg (Germany), who was a visiting scholar at the University of Pennsylvania from 2011 to 2012, was anxious to consult three palm-leaf manuscripts held by ASU. What was originally conceived as a loan of these manuscripts for on-site use by the scholar evolved into a request by ASU for Penn to digitize the three items and make them accessible on *Penn in Hand.* In the spirit of experimentation and mutual assistance for researchers struggling with time and travel, Penn agreed to create and host the facsimiles. Listed strictly as an online resource and with a note concerning the location of the original, each Arizona State University facsimile is fully integrated into the discovery options available on the site (see: http://dla.library.upenn.edu/dla/medren/search.html?q=%22Arizona+State+University%22).

As part of the work undertaken by Penn cataloger Benjamin Fleming for the Endangered Archive Programme, the Penn Libraries will store digital files and *Penn in Hand* will present full facsimiles of 100 to 150 manuscripts of the Ramamālā Library in Bangladesh. The digitized manuscripts of the Ramamālā Library will be made available with a Creative Commons license (Attribution-NonCommercial-ShareAlike 3.0 Unported http://creativecommons.org/licenses/by-nc-sa/3.0/), which will be attached to all digital images and their metadata. Cataloging records will also be created in WorldCat and Franklin.

Although an institution does not always learn of all uses and evaluations of its free online resources, some patrons do make contact, typically via e-mail. Sometimes contact is made for corrections or enhancements to the metadata provided on the site. These messages are extraordinarily helpful. We review the information, make revisions to the original cataloging records as warranted, and update the website overnight. For example, the curator of manuscripts recently received the following e-mail from a

professor in the Département de français et Programme d'études médiévales et de la Renaissance, Université d'Ottawa (Canada):

> Dear Colleague,
>
> I have known the excellent site "Penn in Hand" for a while and I always recommend it to my students. As a very modest way of thanking you and helping you improving the resource further, I would like to submit to your attention a few minor errors in the description of two manuscripts:
>
> CODEX 662
> (The transcription of the incipits and explicits contain a few typos. Here is what we should read:)
> Incipit, first work: Cy commancent les enfances nostre sire et partye [. . .]
>
> CODEX 941
> (The MS actually contains two different works:)
> f. 1ra-93va: Guillaume de Tignonville, "Les dits moraux des philosophes"
> f. 93va-100ra: Jean Courtecuisse, "Les enseignemens de Seneque" (="Le livre Seneque des quatre vertus cardinales")
>
> It would be useful to include somewhere in the description the name of Guillaume of Tignonville, who translated the text from Latin into French.
>
> Please do not hesitate to ask if there is anything. Again, thank you for this great website!

The cataloging records for Ms. Codex 662 and Ms. Codex 941 were updated, and the revised metadata appeared on *Penn in Hand* the next day. It is precisely this kind of collegial exchange and improvement that we anticipate once Penn's Indic manuscript collection can be viewed as facsimiles and not simply as summaries on the Internet.

Collection highlights: The following section reorganizes Penn's manuscripts into twelve categories; some mirror those found in Poleman's catalog, while others combine and rearrange his topics.

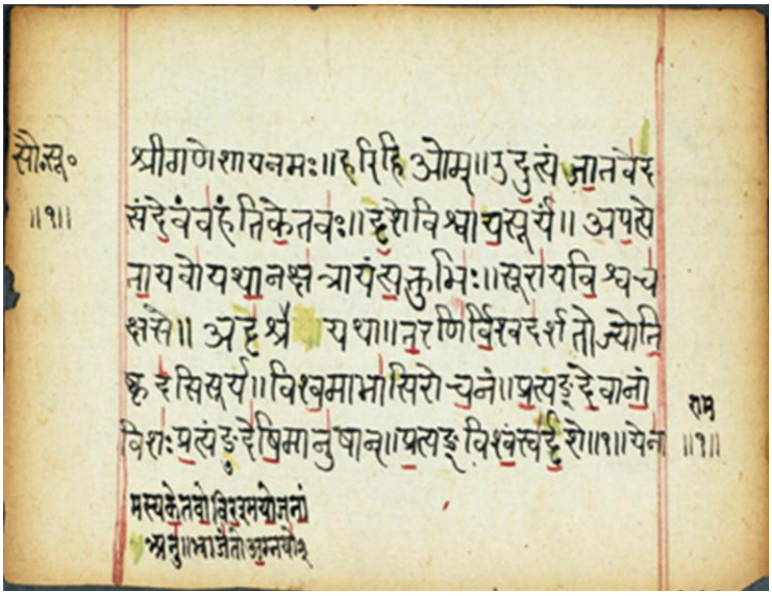
Vedas

Note: Poleman lists the following subcategories: *Ṛgveda*, *Sāmaveda*, *Yajurveda*, *Atharvaveda*, Brāhmaṇa, Āraṇyaka, Sūtra, Late ritual texts, Vedāṅga, Miscellaneous, and Upaniṣad.

Penn has an extensive group of approximately 550 works covering different rites and rituals related to the Vedas, as well as secondary works that fall within the category of ancillary Vedas (Brāhmaṇa, Āraṇyaka, Upaniṣad, Vedāṅga, etc.). The manuscripts were copied from as early as the Mughal era through the 19th century and represent works from ancient (13th to 10th century B.C.) to early medieval texts. The oldest includes copies of the four main branches of the Vedas--the *Ṛg*, *Sama*, *Yajur*, and *Atharva*--and comprises sets of hymns employed at both public and private rituals that center primarily on fire worship as well as the sacrifice of plants and animals.

For the most part the secondary works originate between the 6th century B.C. and 2nd century A.D. (the Brāhmaṇa and Upaniṣads), although they continued to be written until the Mughal era (especially, the Upaniṣads). These secondary works show researchers the manner in which the four ancient Vedas were received, transmitted, and adapted to a shifting religious and political landscape; they comment on and interpret as well as redeploy the earlier materials. The secondary works include sets of ritual manuals specific to different groups of priests (hotṛ, agnīdh, adhvaryu, maitrāvaruṇa, brāhmaṇācchaṃsin, etc.), who preside over and specialize in various aspects of ritual (lighting fires, taking measurements, leading animals, etc.).

One highlight of Penn's collection is a rare 1666 A.D. manuscript of the *Ṛgveda* (Ms. Coll. 390, item 81), which was housed in Vārāṇasī in the renowned library of the Mughal-era scholar Kavīndrācārya Sarasvatī. The item affords an essential glimpse into the transmission of manuscripts at the cusp between medieval and modern Hinduism. The collection also contains a number of Vedic manuscripts written in Grantha, a hybrid Tamil/Sanskrit script, including the *Apastambapitṛmedha* (item 2834), a treatise on funeral rites. They are an important resource for scholars who want to study and understand the influence and dissemination of Sanskrit language, ritual, and culture into that of Tamil Nadu.



Saurasūkta, 1873. Ṛgvedic hymns dedicated to the Vedic deity Sūrya, the sun, transmitted as an independent text of praise to be employed in personal or public meditation and prayer.

Epic

About 140 manuscripts fall under the heading of epic literature. In the context of Penn's collection, epic literature refers to two major Sanskrit works, the *Mahābhārata* and the *Rāmāyaṇa*, composed orally in the early centuries B.C. and later written on paper (with the final redaction around the 4th century A.D.). Penn has an extensive collection of *Mahābhārata* manuscripts and commentaries; these works are among the earliest and richest sources of Hindu myths, Hindu law (dharma), and religious pilgrimage, having been formulated over centuries of recitation, scribal additions, and arrangements.

The collection contains selections and complete works, along with a number of commentaries by such well-known figures as Śaṅkarācārya, Nīlakaṇṭha, and Śrīdharasvāmin. While most manuscripts center on the *Mahābhārata*, several concern the *Rāmāyaṇa* of Vālmīkī, including a traditional glossary of terms (tippaṇa) related to this work (Ms. Coll. 390, item 2799). The glossary constitutes a short, comprehensive handbook, revealing a late-medieval interpretation of the ancient work; it is an important resource for scholars examining the transmission of meaning and lexicon. Penn's collection also contains a rare fourth kāṇḍa, the *Kiṣkindhākāṇḍa*, of Tulsīdās's 16th-century retelling of the *Rāmāyaṇa*, known as the *Rāmacaritamānasa* (Ms. Coll. 390, item 2575). Item 2575 is written in the Awadhi language; the text was particularly popular in North India.

Harivaṃśoddyota, 1778: commentary on the epic text Harivaṃśa, a supplement to the Mahābhārata, focusing on birth and youth of Hindu deity Kṛṣṇa, establishing his central position in Hindu cosmology.

Among the epic texts are approximately thirty-five manuscripts related to the *Bhagavadgītā*, usually considered part of the *Mahābhārata*, although often considered a late addition by modern scholars. Within traditional reckonings, it has a strong liturgical use and individual devotional dedication, which is reflected in the materiality of the manuscripts. The text, in this manner, typically stands alone as a singular praise of Kṛṣṇa and forms part of liturgical and devotional practices (both public and private). For instance, a number of Penn's copies of this text are small, illuminated codices (e.g., Ms. Indic 5 and Ms. Coll. 390, item 2639) and are used for personal reflection and meditation. The *Bhagavadgītā* is also the basis for a number of medieval commentary traditions. Penn holds about a dozen such commentaries of different varieties, written in several styles from various periods of medieval and Mughal-era authors. Examples--including Ms. Coll. 390, items 492, 773, 906, and 2367--appear in the form of marginal notes accompanying the main text of the *Bhagavadgītā*, as texts running parallel (above and below) it, and as independent works in their own right.

Purāṇa

"Purāṇa" literally means "ancient story," although most ancient stories were composed and written down in medieval times. Penn's collection contains a large group of both Śaiva and Vaiṣṇava Purāṇas and is a rich source of information for scholars regarding Hindu mythology, ritual, law, astronomy, art and architecture, gender relations and social order, and other factors pertinent for understanding Indian society and culture in medieval times. Penn has an especially wide selection of manuscripts, about 425 in total, in this genre. Two thirds of these are related to the Hindu deity Viṣṇu and include, most prominently, the *Bhāgavatapurāṇa*, which was one of the focuses of Scharf's NEH-funded project, awarded in 2008.

Penn's collection also holds multiple manuscripts of the *Padmapurāṇa*; especially notable are several copies of its retelling of the *Rāmāyaṇa*, the *Adhyātmarāmāyaṇa*. There is a complete copy of the *Vāmapurāṇa*, as well as a selection of Purāṇas dedicated to the deity Śiva, especially the *Skandapurāṇa*, a text that has recently received much scholarly attention. Holdings related to this work highlight the physical transmission of many of its various parts (kāṇḍas) across different regions and languages, and they offer excellent opportunities for further research. Also available is a rare palm-leaf manuscript from South India in Tamil (*Kandapurāṇam*) of the *Skandapurāṇa* (Ms. Coll. 390, item 2842). Such examples help to illuminate the late medieval formation of this important text, the constitution of which is of interest to scholars working on the ritual, mythological, and institutional development of Śaivism.

Poetry and Related Works

Note: Listed in Poleman under the following disparate categories: Lyric Poetry; Romances, Fables, and Tales (Kāvya, Campū, and Gadya); Miscellaneous Kāvya; and Erotic Literature (Gadya and Padya).

Penn holds more than 150 manuscripts of both foundational and obscure poetic texts, essential to the study of ancient, medieval, and Mughal-era India. Included are works by such prominent authors as Kālidāsa (his *Gaṅgāṣṭaka*, *Meghadūta*, and *Kumārasambhava*; Ms. Coll. 390, items 424, 508, 1480, 1493, 1494, 1518, 1573, 2700) and Jayadeva (especially his *Gītāgovinda*; Ms. Coll. 390, items 536, 1555, and 2590), as well as works by lesser known authors such as the 15th-century poetic commentator and critic Mallinātha, who, in his *Saṃjīvanī* (Ms. Coll. 390, items 1493, 1520, and 1561), treats Kālidāsa's *Raghuvaṃśa*. There is also a poetic treatise on archery, the *Śārṅgadharapaddhati* (Ms. Coll. 390, item 1522), and a work dedicated to the deity Śiva in his dancing aspect, the *Śivatāṇḍavanṛtya* (Ms. Coll. 390, item 2757). These poetic works often explore mythological themes first set out in the epics and Purāṇas and expand, elaborate, and complicate them, employing more complex poetic verse; they are often meant to be sung during Hindu rituals or performed at temples for the public. Themes typically explore emotional states--such as erotic passion, longing, and love--and place them into a devotional context such that fervent followers of a particular god can experience their own emotions as expressions of their reverence and love of the divine.

Song and Praise Works

Note: Cited in Poleman as Gītā and Stotra.

Poleman has classified about ten of Penn's Indic manuscripts under the rubric of Gītā (song) and about another ninety under the related rubric of Stotra (praise literature). Both genres of work are understudied but constitute an essential aspect of religious tradition as practiced by the individual devotee. Such items are often brief or small manuscripts, which can be kept on one's person for daily reflection and meditation; they venerate a number of different places, texts, or gods. Accordingly, texts may give the essence of larger works or give praise to pilgrimage sites that devotees may themselves have little chance of visiting due to economic circumstances. Thus, the *Saptaślokīgītā* (Ms. Coll. 390, item 2601) is a work in seven verses that states it is the essence of the entire *Mahābhārata* (a work that by traditional reckoning has about 100,000 verses); the *Gaṅgāstavanastotra* (Ms. Coll. 390, item 458) praises the river Ganges (Gaṅgā) as the manifestation of a goddess and as both the earthly and heavenly river of the same name.

Grammar; Lexicons; Prosody

Penn's holdings include a strong body--approximately 225 manuscripts--of grammars, lexicons, and dictionaries by more than a dozen well-known and lesser-known grammarians from various periods of Indian literary history. There are, for instance, more than forty works of the grammarian Bhaṭṭoji Dīkṣita, including a 17th-century manuscript of his *Prauḍhamanoramā*, a commentary on his *Siddhānta Kaumudī* (item 208). The collection also contains eight works related to the structure of poetry (prosody), such as two 18th-century manuscripts of the *Śrutabodha* (Ms. Coll. 390, items 799 and 800), which provides a description of thirty-nine different meters used in Sanskrit verse composition (āryā, gīti, upagīti, paṅkti, śaśivadanā, etc.), as well as one commentary (ṭīkā) on this work (item 506).

Religious and Civil Law

Note: Poleman lists the following subcategories of religious law: General Texts, Antyeṭsi (Death), Āśauca, Āhnika; Karmavipāka, Prāyaścitta (Expiation), Gāyatrī, Caste, Tithi, Tīrtha, Dāna, Pratiṣṭhā, Birth, Mantra Texts, Yati Dharma, Vivāha, Vrata, Śrāddha, Saṃskāra, Snāna, and Miscellaneous; Poleman classifies the following additional legal topics: Vyavahāra (Civil Law), Artha, and Nītiśāstra.

Penn has an excellent collection of about 475 works (dharmaśāstras) that cover a range of legal topics related to religious and civil law. The works represented are early medieval to Mughal-era texts. Topics include laws related to birth, death, marriage, penances (daily rites, rites of purification, etc.), as well as laws concerning gift giving, pilgrimage, and more. Many of these works should prove a fruitful source for researchers working in the developing area of Indian legal discourse in the pre-modern world.

One highlight is a rare manuscript of the *Dinakaradyota* (Ms. Coll. 390, item 767), a law code attributed to the Mughal-era Hindu reformer, king Śivajī (1627-1680) from western India. The manuscript contains Śivajī's legal system as formulated and mediated by Dinakarabhaṭṭa, one of his Brahman ministers, and tells us much about the legal discourse of the court during the rise of Hindu reformation in the Deccan region. Another important legal digest is the *Prāyaścittaviveka* by Śūlapāṇi (Ms. Coll. 390, item 1577); it comprises laws and rites of expiation in North India. The collection of legal texts also includes regionally significant items, such as a rare palm-leaf work concerning adoption (Ms. Coll. 390, item 2836) in the South Indian Grantha script (a Tamil-Sanskrit hybrid).

Philosophy

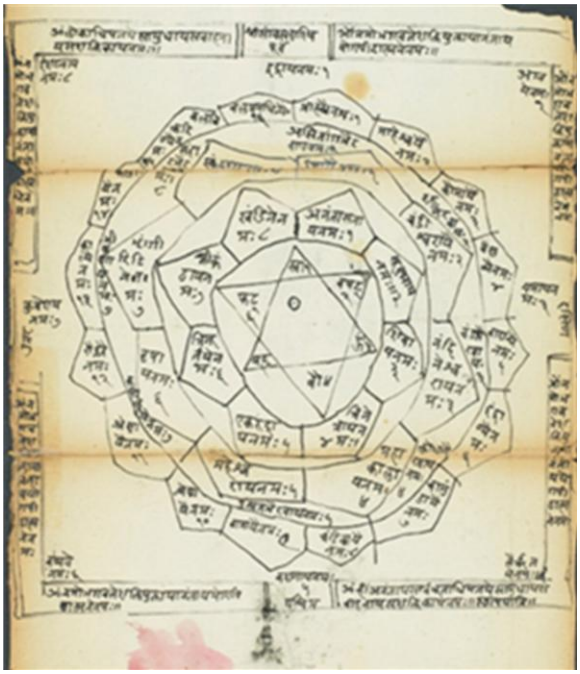
About 550 manuscripts at Penn document a diverse set of traditional systems of Indian philosophy (darśana) by many well-known authors (including Śaṃkara, Rāmānuja, and Mādhavācārya) as well as by many lesser known authors (such as Govindānanda and his student Rāmānanda Sarasvatī). Penn's most extensive concentration of philosophical manuscripts is dedicated to the school of Vedānta philosophy (circa 300 manuscripts), comprising more than thirty individual authors working within

various sub-divisions of this school (Advaita-vedānta, Viśiṣṭhādvaita-vedānta, etc.). The Vedānta school is particularly influential on the literary and religious life of Indian society as a whole, offering various means of religious reflection, social duty, and individual well-being. Penn holds significant works (more than 200) by nearly thirty authors from the school of logical philosophy, Nyāya-Vaiśeṣika (authors like Annambhaṭṭa, Raghunātha, and his pupil Jānakīnātha Bhaṭṭācārya Cūḍāmaṇi). There are also selections from the schools of Saṃkhyā and Mīmāṃsā.

Many authors from the various schools are connected through student-teacher lineages and wrote commentaries and interpretations of each other's work, reflecting the development of Indian thought from the 8th through 18th century A.D. Indeed, Penn's collection is a rich resource for scholars interested in studying the Sanskrit commentary tradition as a means of analyzing the complex processes of textual transmission, interpretation, and reception. While many authors discuss modes of understanding reality and humanity's relationship to it, these texts also provide a vital picture into the manner in which the ruling elite classes structured the social order of their time--an individual's place and function within it--as well as the social, legal, and religious influence of such thinkers on subsequent periods.

Tantra and Yoga

Penn has approximately 150 manuscripts related to the ritual, meditative, and soteriological systems defined by Tantric schools. There are works on Yoga, Śaiva, and Vaiṣṇava systems of liberation, ritual, and initiation. These systems were designed to lead the religious practitioner to a state of enlightenment and ultimate release from the cycle of life and death, as it was understood by medieval thinkers. Penn's manuscripts reflect the development, articulation, and syncretism, especially from the 10th to 18th century. They offer intricate details of ways of imagining the human body and its place within the perceived universe, as it was understood at different moments in Indian cultural and political history.



Śaktiyuktāyānanta, 1700s. Śaiva yantra (Tantric diagram) used in private or public ritual worship. Diagram depicts a many-layered lotus flower (16 petals) containing mantras to various Hindu deities.

One example--a 1716 manuscript of the *Saundarylaharī* (Ms. Coll. 390, item 2478), which represents a Śaiva work dated to the year 1000 A.D.--gives a detailed overview of the system of cakras or bodily power centers thought to be aligned along the human spinal cord and through the top of the head. Two other manuscripts representing a late-medieval work, the *Haṭhapradīpikā* (Ms. Coll. 390, items 1931 and 1932), discuss the *āsana* (body posture) system that becomes central to modern yoga practices in the West. Such examples will assist scholars working in this vibrant field of study, which has recently been the subject of much intellectual debate.

Ancient Sciences

Note: Listed in Poleman under the category entitled "Jyotiṣa": Astronomy and Mathematics; Astrology and Divination, including phalagrantha, etc.; Horoscopy; Prognostication

There are more than 200 manuscripts that fall into the category of "Ancient Science," most having to do with calendrical systems, reading and understanding constellations and the movement of the planets, as well as reading the future through various omens and astrological signs. Because many of these activities involve complex calculations, they are also important for the study of mathematics.

Penn's collection strongly assists scholars studying pre-modern science in India. Among the multiple works in this classification is a rare manuscript, dated 1782, of the *Gaṇitanāmamālā* by Haridatta (Ms. Coll. 390, item 1802); a scarce dictionary describing traditional Sanskrit vocabulary regarding astronomy and astrology, it represents one of the most detailed treatises on mathematics. The collection also contains an uncommon 1688 manuscript of the *Camatkāracintāmaṇi*. Attributed to several different authors, it offers predictions about the future based on the presence of nine planets in each of the twelve astrological configurations. Such works offer scholars a better understanding of the relationship between the wide-spread, pre-modern science of divination and mathematics in India. These manuscripts show that science was a global endeavor and can fruitfully be studied across obsolete cultural boundaries such as Western/Oriental.

18th-century pocket manual or handbook for reading animal and bird omens. Carried around by a jyotiṣī (astrologer) for consultation when engaging with a client. It deals with the auspicious and inauspicious consequences of encountering different birds and animals.

Medicine

Penn holds approximately twenty-five medical manuscripts, several related to Āyurvedic medicine. There is a 16th-century medical diagnostic treatise (especially about diseases), the *Cikitsāmṛtasaṃgraha* (Ms. Coll. 390, item 782) by Gaṇeśa Bhisaj; it offers compelling evidence for linking the text to a family of physicians, spanning five generations, in the Nasik district of Maharashtra. Also available is a copy of Vīreśvarānanda's *Yogaratnākara* (item 769), a treatise on Āyurvedic treatments and therapies.

Other highlights include a copy of the *Ajīrṇamañjarī* (Ms. Coll. 390, item 792), a Nepali text with commentary concerning the use of mercury in therapy, and a wonderfully diagrammed Burmese medical diagnosis handbook meant for quick evaluations and written on mulberry paper (Ms. Coll. 390, item 2967). Among this subset of manuscripts are scribal lists of ingredients, such as fruits and grains, for various remedies (Ms. Coll. 390, item 5246); the lists serve as compendia to standard medical works (e.g., the *Rasarājalakṣmī* by Rāmeśvara). The untitled lists of ingredients help us understand the manner in which medical doctors prepared prescriptions and remedies.

Buddhist and Jain Works

Penn has approximately 110 Indic Buddhist palm-leaf manuscripts. This figure represents a significant body of Buddhist texts from South and Southeast Asia, comparable or greater than collections of similar manuscripts in other American institutions. According to the Poleman catalog, only two repositories--Library of Congress and Columbia University--hold equivalent collections in terms of their diversity of content. Penn's holdings include many canonical works written in Pali and unique works in other languages, such as Javanese, Burmese, Sinhala, Thai, and Cambodian. They cover a range of mythological, artistic, medical, philosophical, and grammatical subjects. Penn also owns about ten paper manuscripts related to the Jain religion, including canonical, artistic, and hagiographic materials.

Use of collection: For more than sixty years Penn's collection of 16th- to 19th-century South Asian manuscripts has served the broader scholarly and academic communities in Philadelphia, the

United States, Europe, India, and elsewhere. These predominantly Sanskrit manuscripts, which offer an array of religious and secular sources from ancient, medieval, and later periods, have been consulted by patrons in advanced stages of research, as well as graduate and undergraduate students from a range of academic disciplines and institutions. Professional scholars, researchers, curators, and students of Indic languages and literatures, history, art history, the history of science and medicine, religious studies, poetics--among other fields of inquiry--have used Penn's manuscripts within the library's reading and seminar rooms and/or through reproductions such as photocopies, microfilms, and digital files. Examples of research inquiries from the past fifteen years appear below, arranged by areas of subject interest.

Poetry and Religious Literature

A Ph.D. student from the University of Pennsylvania consulted Ms. Coll. 390, items 528 and 1524--manuscripts of a work by the 11th-century Kashmiri poet Bilhaṇa and titled the *Caurapañcāśika* (Fantasies of a Love Thief), a work of erotic poetry written from a prison cell--to be part of a dissertation on medieval erotic literature in India.

A professor at the University of Oxford (England) included the *Mantrabhāgavatavyākhyā* (Ms. Coll. 390, item 751) and the *Rāmakalpadruma* (item 768) attributed to Nīlakaṇṭha and Anantabhaṭṭa respectively, in his on-going project dedicated to medieval commentary traditions about Sanskrit epics.

A scholar from the Oriental Institute at the University of Oxford (England) consulted Ms. Coll. 390, item 438, a copy of the *Hanumānvāhukavaca*, a poetic work dedicated to the Hindu monkey-deity Hanuman. Item 438 is a section of the *Kavitāvalī*--by Tulsīdās, the 16th-century Hindi poet--a text for which the scholar is currently preparing a critical edition.

A Ph.D. candidate from the University of Torino (Italy), working on an Italian critical edition of the *Gaṅgāsahasranāmastotra* (a section of the *Skandapurāṇa*), consulted Penn's manuscripts of this text (Ms. Coll. 390, items 2206 and 2351), a religious work of hymns and myths, concerning, in particular, the glorification of the river Ganges, one of India's most revered geographical sites for Hindu pilgrims.

Grammars, Dictionaries, and Catalogs

A scholar from Le Centre d'Études de l'Inde et de l'Asie du Sud, Paris (France) consulted Sanskrit grammatical commentaries, including Ms. Coll. 390, item 243--the *Kāśikāvṛtti* attributed to the 7th-century authors Jayāditya and Vāmana--as well as Ms. Coll. 390, item 1714--the *Tripathagā* by the 17th-century author Rāghavendra--for a critical edition of the *Kāśikāvṛtti* from his research at Penn.

A scholar from St. John's College, Cambridge (England), reviewed a Punjabi manuscript (Ms. Coll. 390, item 2638), a copy of the Ādigranth, one of the foundational texts of the Sikh religion, to be included in a catalog of Punjabi manuscripts in collections in the United States and the United Kingdom.

A University of Pune (India) librarian, who was a Stanley J. Kahrl Visiting Fellowship in Literary Manuscripts, consulted all nine of Penn's manuscripts composed in the Marathi language on a range of topics including Marathi dictionaries and glossaries as well as Marathi commentaries on Sanskrit texts (Ms. Coll. 390, items 547, 604, 756, 780, 1119, 1145, 1174, 1927, and 2646).

History of Science and Medicine

A professor from the University of Vienna (Austria) consulted Ms. Coll. 390, item 782--the *Cikitsamṛtasaṃgraha* of Gaṇeśabhiṣak, a 19th-century Indian physician writing on diagnosis for a variety of diseases--for an article on the history of Indian medicine and practice in Maharashtra.

In 2007 the American Museum of Natural History in New York held a major historical exhibition entitled "The Nature of Diamonds," which generated a catalog published by Cambridge University Press. The exhibition and catalog included images and discussion of Ms. Coll. 390, item 801, the *Maṇiparīkṣā* (The Examination of Jewels) by Buddha Bhaṭṭa (6th century), which summarizes through mythic accounts of origin Indian knowledge of diamonds and other precious gems.

Yoga and Tantra

A recent Ph.D. graduate from Cambridge University (England) and a professor from the University of Vienna (Austria) are consulting several of Penn's manuscripts and plan to include them as part of an international research project to develop a yoga history, literature, and manuscripts website. The manuscripts are part of Ms. Coll. 390 and include item 249, *Yogasūtra*, as well as items 1923, 1924, 1926, 1930, and 1936, versions of the *Yogabhāṣya* (a commentary on the Yogasūtra by the 10th-century Vedanta philosopher Vācaspati Miśra).

A Ph.D. student in the Department of South Asian languages at the University of Texas, Austin, is also consulting a number of manuscripts related to the subject of Yoga. They include Ms. Coll. 390, item 889, the *Yogatattvopaniṣad*; item 916, the *Yogaśikhopaniṣad*; item 842.26, the *Tejobindūpaniṣad*; and item 842.5, the *Haṃsopaniṣad*. Each manuscript will be included in a critical edition of the Yoga Upaniṣads, which the student will make part of his dissertation.

A scholar from the Kaivalyadhama Institute in Lonavla (India) consulted Ms. Coll. 390, item 1925, a section from a text called the *Siddhasiddhāntapaddhati* (Path of Final Accomplishment) by *Gorakṣanātha*, for a research project on the history of Haṭhayoga, a precedent for understanding the development of modern yoga practices.

A scholar from Thomas Jefferson University, Center for Integrative Medicine, Philadelphia, consulted Ms. Coll. 390, item 580--the *Akulāgama Mahātantra Yogasārasamuccaya*, a Tantric treatise from Nepal dealing with Yoga--for an entry she was writing for an encyclopedia on Yoga.

A Ph.D. graduate from the University of Pennsylvania consulted material from Ms. Coll. 390--items 439, 694, 1981, 2502, and 2515--all related to the *Brahmayāmala Tantra*, an early Śaiva Tantric work containing some of the oldest textual evidence for the goddess or Yoginī cult in medieval India.

Art History

A curator from the Philadelphia Museum of Art included two of Penn's manuscripts in an exhibition entitled "Making the Path to Perfection: Art for the Jains in India." One is an illuminated Jain manuscript, Ms. Coll. 390, item 3020, a version of a 15th-century text *Kalikācarya Kathā*, a hagiography of a famous Jain sage who lived in North India in the 1st century A.D. The second (Ms. Indic 7) is a long, illuminated scroll painting on cotton called the *Pratiṣṭhādevatāvisarjanamantra*, a text prescribing a ritual mantra for inviting and expelling gods into sacred images of Jain deities and spiritual leaders.

A scholar from Seton Hall University, New Jersey, consulted the *Candraloka-prāśa* (Ms. Coll. 390, item 1479), a commentary on a medieval treatise on poetics, especially the science of beauty (alaṃkaraśāstra), by the medieval Indian poet Jayadeva, for a book on this topic.

A Ph.D. student from Temple University, Philadelphia, consulted and translated selections from an illustrated manuscript of a Burmese medical treatise (Ms. Coll. 390, item 2967) for a dissertation on Buddhist art history in South East Asia.

Saṅghayaṇasūtra an 18th-century manuscript on the structure of the Jaina cosmology, originally written in the 12th century by Śrīcandrasūri. Depicted is the Loka Puruṣa or the Cosmic Man. The manuscript comes from the Sirohi district of Rajasthan, India.

A scholar from the Indira Gandhi National Centre for the Arts, New Delhi (India) consulted Ms. Coll. 525--*Kitab-i-Tasvir-i-Shishagaran* (The Illustrated Book about Makers of Glassware, etc. and A Description of Their Tools), a 19th-century Indo-Persian illustrated treatise by Ghulam Yahya. The work concerns the manufacture of glassware and the tools of glass makers. The research resulted in a translation and reproduction of the manuscript in an online publication by the Penn Libraries.

In addition to the list above, faculty from the departments of South Asia Studies and Religious Studies at Penn consistently bring undergraduate Sanskrit-language students to see Sanskrit texts in manuscript form and learn about the material transmission of these works. They have examined some new acquisitions as well as items selected from Ms. Coll. 390.

This list of manuscript users is a small sample of the interest in Penn's early modern, South Asian manuscripts and their value for scholars within and beyond the University of Pennsylvania. While the primary entrée to the collection has been the 1938 catalog edited by Poleman, more recently a limited selection of manuscripts (about five percent) have been made available through facsimiles on the website *Penn in Hand*, which has helped to promote the visibility of the collection. Such improvements to access and dissemination, made possible by the proposed project, will substantially increase consultation and use of Penn's Indic-language manuscript collection.

History, Scope, and Duration

Cataloging of some of Penn's Indic manuscript collection in MARC format has been partially funded by a small grant from the Walter J. Miller Trust. To date, approximately one third of the holdings have been cataloged, with records appearing in Franklin, Penn's online catalog, as well as in WorldCat. By 1 July 2014, the proposed start date of this project, approximately forty-five per cent of the collection will be cataloged.

Systematic digitization of the Rare Book & Manuscript Library's Indic-language manuscript collection has no previous incarnation or history. On the other hand, the 2008 Sanskrit manuscript project, directed by Peter Scharf at Brown University and funded by the NEH, required the digitization of approximately 150 of Penn's manuscripts. The current proposal will not only make use of the digital facsimiles created for that project but also build on the work accomplished in the library's current and past NEH-funded projects to digitize Western manuscripts up to 1801 and to deliver complete facsimiles over the Internet. The website, *Penn in Hand: Selected Manuscripts* is currently fully functional not only as a discovery site for Penn's medieval, Renaissance, and early modern manuscripts produced in Europe and the United States but also for the Indic manuscripts already digitized.

Penn in Hand offers full facsimiles of manuscripts within a week or two of being photographed. To date the preponderance of the facsimiles entail European and American manuscripts created before 1801 because of the two projects funded by the NEH. A couple of years ago the website was updated to serve as the delivery system for other kinds of manuscripts, such as Indic-language items. Given the creation of digital files for the NEH-funded project directed by Scharf (Brown University), Penn decided to make those facsimiles available on the Internet. This fact offers a great advantage for the proposed project: no programming updates are needed for the website, and items shot can be made available to the public within a week or two of the start date.

The projects to digitize Penn's Western manuscripts dated from 1000 to 1800 offer a wealth of experience to undertake the digitization of the Indic manuscripts. The department of Information Technologies & Digital Development (ITaDD) has responded rapidly to requests for amendments and enhancements to the website, such as (1) defaulting to the correct orientation for page-turning (left-to-right for most, but right-to-left for material written in Arabic or Hebrew), (2) providing an advanced search option, (3) defaulting to a two-page view for codices but offering only a one-page view for unbound manuscripts, and (4) implementing image rotation as an added feature. In addition, within the next year, the site will offer a direct link to XML files of cataloging metadata, which will be openly

exposed through the use of Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH) as described under "Dissemination" (page 18). By the conclusion of the proposed project (31 December 2016), *Penn in Hand* will offer direct downloads of high-resolution image files (600-dpi TIFF files) with a Creative Commons license.

Among the resources available at Penn for the project is the Schoenberg Center for Electronic Text & Image. Since 1996 SCETI has enhanced the research and scholarly use of rare books, manuscripts, and other primary source materials by making them accessible worldwide, and it now reports to the MacDonald Curator of Preservation, who oversees the care and handling of original materials when photographed. SCETI creates archival-quality digital facsimiles, and through the DLA, a project of the department for Information Technologies & Digital Development (ITaDD), makes them available online. The DLA is a piece of the Penn Libraries' software infrastructure that enables the Web delivery of digital content and digital records.

Methodology and Standards

The proposed project comprises three principal activities: machine-readable cataloging (MARC), digital photography, and storage and maintenance of the digital files in the Penn Libraries' Repository. The repository infrastructure ensures proper technical curation and access for deposited materials. It is in the repository that digital preservation workflows are being built to provide for long-term access to these materials.

In terms of the cataloging component, the manuscripts cataloger creates original records in OCLC; the entries are then exported to the University of Pennsylvania Libraries' online catalog, Franklin. Working twenty-eight hours per week, the project cataloger describes approximately fourteen items per week, yielding an additional 1,680 records by the end of the thirty-month grant period. The cataloger evaluates the data provided in Poleman's *Census* in relation to the original manuscript, correcting wrong or incomplete information, verifying collation, and enhancing the bibliographic description through the inclusion of: Library of Congress subject headings, form and genre headings from the *Art & Architecture Thesaurus*, the names of scribes (if provided), dimensions, author names and titles in vernacular scripts, contents, and hot links to digital facsimiles (once completed and available on *Penn in Hand*). The cataloging protocol for these predominantly 18th- and 19th-century manuscripts is *Describing Archives: A Content Standard*. See Appendix A for an original cataloging record for an Indic-language manuscript.

Since 2009 the delivery of SCETI's digital images to the Web and the storage and long-term care of its image files have been incorporated into the workflow of ITaDD (Information Technologies & Digital Development). The output of the past, current, and future NEH-funded projects benefits from the ongoing care and maintenance provided by one of the library's most central departments. The delivery and archival storage of images and metadata to *Penn in Hand* is fully integrated into the fabric of library services offered through ITaDD and its DLA initiative, which is funded from predictable streams of allocation (library's annual operating budget) and is not dependent on opportunistic funding.

This proposal estimates the creation of digital facsimiles for approximately 2,850 discrete items, averaging 75 leaves per item (a number that represents 76 digital files per item). Over the course of thirty months approximately 216,600 digital files will be created. Work is expected to proceed at an approximate rate of 1,800 shots per week. Cataloged manuscripts will be selected for photography, creating a queue for the camera operator. The curator of manuscripts, who is the project director, will review the condition of selected items for safe shooting, referring materials in need of conservation treatment to the conservation specialist. The digital data coordinator will then enter metadata into the administration system for each item. Working with SCETI's imaging assistant, the project's camera operator will capture the images. An image processor will then check and process the files. The digital data coordinator will spot check the processed images, referring problems to the library imaging assistant. Upon verification of corrections, the digital data coordinator will gather, test, and collate the persistent URLs and then revise the related cataloging records in WorldCat and Franklin: MARC code provides a

variable field (856) in which a cataloger may input a unique URL for the facsimile of the item being described in the cataloging record. The link takes the researcher directly to the digital facsimile.

In general, the Schoenberg Center for Electronic Text & Image follows the NISO standards as articulated in *A Framework for Building Good Digital Collections*, 3rd edition (http://www.niso.org/publications/rp/frameworks3.pdf). The following represents specific standards adopted by SCETI and the department of Information Technologies & Digital Development in their capture, storage, and presentation of digital images.

Photography specifications:

- Archival Masters: 600 PPI 24-bit raw TIFF image; 600 PPI 24-bit LZW color image
- "Golden Thread" color target is used for every exposure. Target also includes interference pattern and inch/centimeter markings. Target is also used to check focus.
- Standards:
  California Digital Library. *CDL Guidelines for Digital Objects*
  http://www.cdlib.org/inside/diglib/guidelines/
  Library of Congress. *Building Digital Collections: A Technical Overview*
  http://memory.loc.gov/ammem/about/techIn.html

Photography & Processing Equipment

- Cameras: For the purpose of this project two Phase One P45 digital cameras will be used. The P45s are state-of-the-art, manual-focus 39-megapixel cameras.
- Lenses: Schneider-Krueznach lenses.
- Reprographic Stands: Two TTI (Tarsi Technical Industries) copy stands.
- Lighting: Although both cameras have auto flash features, we have the following lighting system for the camera stands: ProPhoto Acute D4 heads and "beauty dish" reflectors placed at 90 degree angles to item surface.
- Camera Computers: Two Dell 980 desktops: 2.80GHz Intel® Core i7, Quad-Core 860 processor, 512MB ATI Radeon HD 4550 Graphics, 4GB DDR3 1333MHz RAM (2x 2GB), 500GB, 7200RPM hard disk, Windows® 7 Professional operating system.
- Processing Computer: Dell Optiplex 990 desktop: Intel® Core i7 2600 (3.4 GHz, 8M) processor; 8 GB DDR3, Non-ECC, 1333MHz Dual Channel SDRAM, 2x4GB memory; 1 GB AMD Radeon HD 6450 (1 DP/DVI), low profile video card; 250 GB 3.5 6.0Gb/s SATA with 8MB DataBurst Cache for boot hard drive; Windows® 7 Professional operating system.
- Software: Phase One Capture One Pro; Photoshop CS3.

Image delivery format: For many years the library used the MrSid format for all digital-image delivery. In 2010 ITaDD developed the back end and front end of the software architecture that enabled the migration to JPEG 2000 (http://www.jpeg.org/jpeg2000/), an open-source format that is quickly becoming the standard for image delivery in the digital library community. The JPEG 2000 images are delivered to the end users through Djatoka, an open-source JPEG 2000 delivery application that enables "Google Map-style" tiling and quick zoom-in and zoom-out options (http://sourceforge.net/apps/mediawiki/djatoka). For the encoding from TIFF to JPEG 2000, the library uses the Kakadu encoder bundled with Djatoka.

Metadata and indexing: Metadata for storage and presentation of the digital facsimiles will be derived from the MARC cataloging records prepared by the project cataloger and will be enhanced with page-level description prepared by the digital data coordinator. The Penn Libraries have developed a multi-purpose, digital-content discovery and delivery system called the DLA (Digital Library Architecture). It is based on open-source applications including Lucene, Solr, Cocoon, and Glassfish, and it relies on XML and XSLT, both for data ingest and HTML generation. The DLA has been operating for six years and is now powering fifteen different sites at Penn (http://www.library.upenn.edu/dla/),

including *Penn in Hand*, the user interface for this project. For the proposed project, the following outlines the work flow.

The page-level metadata is generated during image capture by the camera operators and collated with metadata entered by the digital data coordinator in a local database. The information includes both descriptive and structural metadata:

- The actual position of the page in the physical organization of the manuscript
  - * The visible page number
  - * Whether the page marks the beginning of a division (e.g., a chapter or a new title) or contains any marginalia or illustrations
  - * The ID of the corresponding image file
- Please note that a unique ID distinguishes each manuscript and is referred to in the page-level metadata, thus ensuring that object-level and page-level metadata (including image files) can be collated into a complete digital object at any time.
- In the library's new data curation architecture (see section "*Data curation and long-term preservation. Software infrastructure*" on page 17), the descriptive and structural metadata will also be harvested and stored in a curated METS file for long-term archival purposes.
- A nightly automated process harvests the object-level and page-level metadata pertaining to the project manuscripts, transforms it into Solr-specific XML records, and lets the Solr application ingest and index the records. During the process various searchable fields and facets are generated based on the specific needs of the *Penn in Hand* site.

Faceted metadata searching: One goal of the project is to improve the user experience. To that end Penn has implemented a Solr/Lucene (http://lucene.apache.org/solr/) faceted-browsing module, which will enhance the user's ability to navigate and discover manuscripts that meet specific research needs. Faceted browsing reveals the cataloging records in such a way that users can filter their searches based on a default page view that includes the categories and the number of items within a group. Facets can be combined, narrowed, or expanded according to the user's preferences. In addition to faceted browsing, users are able to perform text searches as well. A DLA website exposes facets in the metadata in dynamic taxonomies, so that users searching for material can see exactly the options they have available at any time. They are able to switch easily between searching and browsing, using their own terminology for searching while recognizing the organization and vocabulary of the data. Features for metadata searching include (1) displaying aspects of the current results set in multiple categorization schemes; (2) showing only populated categories, no links leading to empty lists; (3) displaying a count of the contents of each category, warning the user how many more choices they will see; (4) generating groupings dynamically, such as title, author, and date; and (5) drilling down by facet, so a researcher could choose language, century, illustrations, musical notation, and so forth.

In addition, the DLA team has enhanced its sites by offering keyword and Boolean searching, including an advanced search. A link leading to the "Advanced Search" interface appears in the navigation links at the left side of the site. The advanced search allows for keyword searching within particular fields and combinations of searches in multiple fields. In each search string, truncation and wild cards may be used. The DLA-powered site, *Penn in Hand: Selected Manuscripts* (http://dla.library.upenn.edu/dla/medren/), has been available since the fall of 2009, completed during the first quarter of the NEH-funded project to digitize medieval and Renaissance manuscripts.

The following facets and the order of the facets on *Penn in Hand* have already been implemented and are fully functional:

Collection [from MARC variable field 852 or variable field 655]--the patron is given the option to select from several subsets or collections

Facsimile [from MARC variable field 999]--the patron has the option to select only those items that have a full facsimile available

Illuminated [from MARC fixed field 008]: the patron has the option to click a "yes" prompt
Illustrated [from MARC fixed field 008]--the patron has the option to click a "yes" prompt
Notated [from MARC fixed field 008]--the patron has the option to click a "yes" prompt
Language [from MARC fixed field 008 or variable field 041]--the patron is given a list of languages represented in the collection from which to choose
Century [from MARC variable field 655, subfield y]--the patron is given a list of centuries represented in the collection from which to choose
Date [from MARC fixed field 008]--the patron is given a list of dates represented in the collection from which to choose
Form & Genre [from MARC variable field 655]--the patron is given a list of forms and genres represented in the collection from which to choose
Subject [from MARC variable fields 600, 610, and 650]--the patron is given a list of subjects represented in the collection from which to choose
Author [from MARC variable fields 100 and 110]--the patron is given a list of authors represented in the collection from which to choose
Related Names [from MARC variable fields 700 and 710]--the patron is given a list of names, with relator terms (when present) such as "scribe" or "former owner"

Sustainability

South Asia Studies at the University of Pennsylvania: During the 1880s the University of Pennsylvania was one of the first American academic institutions to offer courses in Sanskrit. In 1926 Penn's chair of Sanskrit, W. Norman Brown, organized the American Oriental Society, and by the 1949-50 academic year a full program in South Asia Studies was offered at Penn. Brown brought together a number of eminent scholars such as Holden Furber, Stella Kramrisch, and Ernest Bender, ensuring that the Department of South Asia Studies became and continues to be one of the most important places in the world for serious research on South Asia in general and Sanskrit in particular. This program of pedagogy and research has been supported by the South Asia Center (Title VI National Resource Center), the Center for the Advanced Study of India, and the University Libraries.

The Penn Libraries maintain research-level collections in Sanskrit (Vedic and classical), Prakrit, Pali, Hindi, and Urdu, and has large holdings—with an emphasis on belles-lettres, folklore, history, and linguistics--in Arabic, Bengali, Dari, Gujarati, Kannada, Kashmiri, Konkani, Malayalam, Marathi, Mongolian, Nepali, Panjabi, Persian, Pashto, Rajasthani, Sindhi, Sinhalese, Tamil, and Telugu. The library holds at least 300,000 volumes that relate specifically to South Asia, as well as other material concerning the broader region. The South Asia reading room houses a collection of reference works as well as the South Asia Art Archive, which comprises over 115,000 photographs and more than 4,000 color slides of Indic architecture, painting, and sculpture. There is a dedicated line for a librarian for South Asia Studies. The position is currently held by Pushkar Sohoni, who received his doctorate in the history of art from the University of Pennsylvania and worked as a post-doctoral fellow at the University of British Columbia.

Data curation and long-term preservation. Hardware infrastructure: Currently the library's master TIFF images are stored in Compellent Storage Array, which combines high availability, superior performance, and expandable plug-and-play storage backplane. The Compellent Array provides tiered storage in a hierarchically managed system to provide the best redundancy and performance needed by this project. The storage architecture is easily expandable to ensure that enough space is available to meet the needs for archival storage of these digital assets. Attached to the storage array is a Qualstar XLS robotic tape library with four LT05 tape drives, which will be used for near-line archival storage and backup. This new storage will provide ample room for the Penn Libraries' growing digital collections and will allow us to implement progressively enhanced security and long-term preservation mechanisms.

Data curation and long-term preservation. Software infrastructure: ITaDD recently completed development of a systematic data curation software infrastructure. This infrastructure is based in part on

the Data Curation Micro-Services standards established by several institutions, including most notably the California Digital Library (http://www.cdlib.org/services/uc3/curation/) (see also John Kunze, *Permanent Objects, Evolving Services, and Disposable Systems: An Emergent Approach to Digital Curation Infrastructure*: PASIG, 2009 http://lib.stanford.edu/files/pasig2009sf/pasig-2009-pods.pdf). The standards that this approach encompasses are:

- PairTree (https://confluence.ucop.edu/display/Curation/PairTree)
- CAN (https://confluence.ucop.edu/display/Curation/CAN)
- D-flat (https://confluence.ucop.edu/display/Curation/D-flat)
- ARK (https://confluence.ucop.edu/display/Curation/ARK)

These standards are supplemented with METS (http://www.loc.gov/standards/mets/), used most particularly to store an archival-quality expression of the physical and logical structure of composite objects like manuscripts facsimiles. This curation infrastructure leverages the hardware and software infrastructures to enable digital object auditing, validation, and format migration. The infrastructure ensures digital object persistence and recoverability through hierarchical file-management services, replication, and off-site storage. The re-engineered digital object workflow packages objects with related descriptive, administrative, structural, technical, and rights metadata to enable automated validity checks, format management, indexing for discovery, and clear parameters for the use and re-use of objects.

Long-term access or persistence: The Penn Libraries ensure persistent access to their digital objects by using institution-specific handles, each digital object being associated with a unique URL. While Penn stays committed to supporting existing handles in the long term for legacy reasons, the library is also currently considering the implementation of the more generalized ARK-based identifiers. ARK (https://confluence.ucop.edu/display/Curation/ARK) is a powerful, cross-institutional framework, implemented by the California Digital Library, the British Library, and the Internet Archive.

Dissemination

Upon news of an award from the NEH and upon the conclusion of the project, press releases will be written and distributed both to general publications and websites, such as the University of Pennsylvania's alumni magazine *The Gazette*; its online, bi-weekly publication *Penn Current*; the Center for South Asia Studies newsletter; the library's website; and to publications and listservs devoted to South Asian and Asian studies and to special collections, such as BABEL, DIGLIB, EXLIBRIS and the listserv for the History of Material Text, a site whose membership exceeds 20,000 individuals from more than thirty countries. Penn Library staff anticipate talks about the NEH-funded work--and the website, in particular--at professional conferences such as Society of American Archivists, the Association for Computers and Humanities, the American Oriental Society, and the American Academy of Religion.

The most potent form of dissemination is already embedded in the project's work plan: the accessibility of the facsimiles on the Internet. Portals or direct links to the facsimiles will be available from (1) cataloging records in WorldCat and Franklin; (2) the project's own website with faceted searching; and (3) Google searches and links from related websites to the project's own website. In addition, the site is now officially exposing all its metadata through OAI-PMH: any OAI-PMH harvester can point to the site's URL and harvest its metadata.

A variety of initiatives worldwide have sought to compile a census of Indic manuscripts or to catalog and preserve Indic manuscripts or to digitize and make available Indic manuscripts over the Internet. Penn's project is significant in that it would complete the bibliographic control and full digital reproduction of the largest collection of Indic manuscripts in North America. The metadata as well as the digital facsimiles--under a Creative Commons license--will be easily discoverable and harvestable directly from the Internet for anyone or any institution wanting to integrate Penn's holdings into a current or future project that lists, displays, compares, or transcribes such works. So the products of this project--metadata and facsimiles--will be disseminated by their use in existing and newly imagined projects.

Work Plan

At the conclusion of this project Penn will produce 1,675 MARC cataloging records in WorldCat and Franklin and full digital facsimiles of 2,850 Indic manuscripts. This work represents the completion of descriptive cataloging and digitization of all of Penn's 3,050 Indic manuscripts. The collection is the largest in North America and contains materials from 1527 to 1930 in Sanskrit, Hindi, Marathi, Awadhi, Nepali, Braj, classical Tamil, Thai, Prakrit, and Pali.

April-June 2014 (between the time of the award announcement and the start of the project). Upon learning of the success of Penn's application to the NEH, the project director will create and distribute a press release regarding the project and funding from the NEH. New project positions will be posted, and new project staff will be interviewed and hired.

July 2014 to November 2016. For the run of the project, the following work will repeat itself weekly:

1. The manuscripts cataloger catalogs approximately fourteen items.
2. The curator of manuscripts selects twenty-three items to be shot in the *following week* and refers any conservation work to the conservation specialist.
3. The conservation specialist treats any identified manuscript material for safe photography.
4. Page-level information, such as foliation or pagination, table of contents, and illustrations, for twenty-three manuscripts is entered into the SCETI administrative system by the digital data coordinator. The DLA program then generates a handle (persistent URL). Although this work will be performed weekly, the digital data coordinator will prepare manuscripts a week *before* the camera operators shoot the items.
5. The camera operator retrieves a prepared manuscript and sets up job at camera station.
   - 5.1 The camera operator sets object color target and adjust camera settings to project specifications for hue/saturation, color balance, and brightness and contrast.
   - 5.2 The camera operator shoots openings including shots of single pages or covers.
   - 5.3 The camera operator reviews and crops raw images using Capture One software. After this work is done, the images are set to process, creating an output of 600-DPI TIFF files.
   - 5.4 The camera operator transfers the files to the network server.
6. Once on the network server, files are ingested by the DLA via JPEG 2000 software. At this point, an ARK is minted for the image, the TIFF image is converted into derivative formats for thumbnails and web delivery, and format characterization and validation processes are performed on the image.
7. For quality control, the digital data coordinator reviews the digital files for each manuscript to ensure all folios have been photographed and that they meet project standards. The coordinator creates a log of problem images and missing files.
8. The digital data coordinator provides error reports to the camera operator. The camera operator re-shoots faulty images and missing folios as required.
9. Archival master files are automatically copied to the backup server.
10. The digital data coordinator creates MARC 856 fields in WorldCat and Franklin, entering the handle generated in Step 4.

December 2016. Verification that all work has been completed; assessment of project, such as work flow, responsibilities, rate of output, etc.; compilation of information for final narrative report and for press releases and notifications.

January to March 2016. Preparation and submission of final report to the NEH; publicizing the project through appropriate forums.

Project Staff

Project director: Nancy Shawcross, Curator of Manuscripts, Rare Book & Manuscript Library (30% of full-time employment) [résumé, Appendix B]. Duties: project oversight, including preparation of reports to NEH; liaison with preservation librarian and conservation specialist; liaison with project

manager; liaison with staff in Libraries' Financial & Research Services; liaison with staff in the Libraries' Digital Data Initiative.

Project manager: Michael Overgard (20% of full-time salary) [résumé, Appendix B]. Duties: serve as liaison with imaging staff; gather statistics about progress of project.

Project cataloger: Benjamin Fleming, Rare Book & Manuscript Library (100% of part-time employment--28 hours per week) [résumé, Appendix B]. Duties: cataloging Indic-language manuscripts in MARC according to cataloging principles articulated in DACS, including the entry of author and title information in vernacular scripts.

Digital data coordinator: Hourly-paid staff--to be hired (1,000 hours per year). Duties: create records in the SCETI administration system for each manuscript, including a table of contents, when necessary, and an index to the illustrations, when appropriate; assess the physical condition of the manuscript and refer problems to the project director; perform quality-control check for each completed facsimile (assessing clarity and completeness of images and verifying page order); refer problems to photography supervisor.

Conservation specialist: Sibylla Benatova, Rare Book & Manuscript Library (25% of full-time employment) [résumé, Appendix B]. Duties: in consultation with the curator of manuscripts evaluate and, when required, complete conservation treatment on project manuscripts; oversee student workers in the preparation of custom enclosures for Indic manuscripts.

Conservation assistants: Student workers, Rare Book & Manuscript Library (20 hours per week in total). Duties: under the supervision of the conservation specialist, measure manuscripts and create custom archival-quality enclosures.

Preservation Librarian: Ian Bogus, MacDonald Curator of Preservation (10% of full-time employment) [résumé, Appendix B]. Duties: Supervision of imaging staff.

Imaging assistant: Chris Lippa, SCETI (20% of full-time employment) [résumé, Appendix B]. Duties: trouble-shooting and oversight of daily operations; oversee registration of manuscript target information and spot color correction.

Camera operator: Craig Taylor (100% of full-time employment) [résumé, Appendix B]. Duties: handle manuscripts according to prescribed conservation techniques; understand and deploy project photography specifications; use and adjust digital camera settings for each item; set up and shoot objects using appropriate conservation support systems; adjust lighting systems; understand camera software and post-capture processes; re-shoot problem images as required.

Project image processors: Two hourly-paid staff--to be hired (each at 1,000 hours per year). Duties: process digital images using Capture One 5.1 software; processing includes standardizing crop box sizes for image files in each Capture One session and making small rotation adjustments for correct alignment. Set files to process to create output as TIFF files. If necessary, clean background of image files by opening TIFF files in Photoshop. Transfer completed TIFF files to network.