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Image as Interface: Consequences for Users of Museum Knowledge

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Abstract

Photographs of objects are ubiquitous in the work and presentation of museums, whether in collection-management infrastructure or in Web-based communication. This article examines the use of images in these settings and traces how they function as interfaces and tools in the production of museum knowledge. Because images are not only the main material presented but also become multilayered objects on which to act in order to access or produce knowledge, they play a key role in the involvement of users with museums. This development is analyzed in the context of the Tropenmuseum (an ethnographic museum in Amsterdam, the Netherlands) based on an ethnographic study of visual practices at and about the museum. Drawing on science and technology studies and new media studies, our theoretically driven analysis demonstrates how images as interfaces provide networked contexts for museum knowledge. The various dimensions of images as interfaces in museums are explored through the questions: How are users engaged by these interfaces? Which skills and strategies are needed for this engagement? What are the consequences of visually mediated interfaces for users of digital knowledge in/about/from museums, archives, and other collections? These developments are discussed in terms of their consequences for how museums view their role.

Introduction

A strong trend in the design and presentation of digital collections is to use images as interfaces. In the context of museums, archives, and libraries, these digital images traditionally have a documentary function; they

posit objects as referents that one might witness during a visit (ethnographic objects, books, maps, etc.). In these contexts, the way images take on instrumental and authoritative roles remediates tradition and supports new practices (Bolter & Grusin, 2000). Comparing, producing, sharing, annotating, searching, and viewing such images are increasingly important epistemic strategies. While all photographs carry traces of their context of production and use, the photographic images considered in this chapter have a particular embedding at the intersection of digital technologies and electronic networks. In this context images are portable, spontaneously produced, and easily translatable across technological platforms. Furthermore, this intersection also means that images can be related to each other within databases or with many other resources on the Web and that they serve as support for mediated social interactions such as discussion, annotation, or photosharing. The images are therefore not only the main material presented but become themselves forms of engagement and of embedding that shape access to and the production of knowledge.

In this article we analyze how these new practices are developing in the context of the Tropenmuseum (an ethnographic museum in Amsterdam). The Tropenmuseum is a useful case for our analysis for at least two reasons. First, the museum makes extensive use of a Web-based collection database of images in a system called The Museum System (TMS). The database not only structures much of the institutional work processes within the museum, but also (re)defines what can count as the collection and the ways in which other users can interact with the collection via digital images. Second, the database is progressively configuring images as interfaces to other kinds of information and to other kinds of activities.

At the Tropenmuseum, the main institutional investment in collections management has been in the development of the Web-based image database, TMS. This collection database was put into use in 2000 and carried a number of promises: of modernizing the museum, of improving management, and of enabling the museum to become a better caretaker of its collections. In addition, the museum explicitly aimed at using the database to change user interaction with the collections for employees and for museum and museum website visitors alike. The hope was that the networked database would diminish the number of times museum employees would need access to depots by replacing the practice of handling physical objects by that of consulting a collection database. The database was also introduced with the goal of making the museum collections available to a wider audience (including its original community) via the Web and to help multiply the number of visitors to the website and the museum.

While TMS is an extremely important factor in transforming interactions with the Tropenmuseum collections, other projects are also changing the role of users. Following international trends in the museum world,

the museum is currently investing in other new, distributed infrastructures for visual knowing. Several of these initiatives focus on involving new users by using images as interfaces.

Our analysis of the consequences of deploying images as interfaces for users of museum knowledge is guided by the following questions: (1) How are users engaged by these interfaces? (2) Which skills are needed and how are they learned? (3) What are the consequences of these visually mediated interfaces for users of digital knowledge? Because they cut across issues of digitization, such as metadata, outreach, personalization, and user engagement (Marty, 2007), images treated as interfaces enable us to explore the links between digital culture and museum practices. These images thus help constitute new forms of knowledge production in relation to practices of user engagement via digital forms, including the new values that may arise from such intersections (Mason, 2007).

This article is based on ethnographic fieldwork at the Tropenmuseum in 2009. The fieldwork consisted of systematic participant observation; open-ended interviews with museum employees and visitors; a detailed scrutiny of new Web-based initiatives in relation to the museum collection; and an examination of official policy documents, relevant archival material, and funding applications relating to digitization and information management. Conceptually, we draw on two bodies of work: new media theory and science and technology studies (STS). Together, they allow us to analyze mediation processes and the dynamics of technologies involved in manipulating and circulating images. We use new media studies to analyze the co-existence of different frameworks of mediated interactions with images. This approach enables us to scrutinize these interactions in relation to other spheres of visual culture and to the history of representations (Cartwright, 1995; van Dijck, 2005; de Rijcke, 2008a, b). STS emphasizes the importance of innovation and embedding of new forms of knowledge, including material and institutional aspects (Beaulieu, van Heur & de Rijcke, 2010; Hand, 2008). Furthermore, we take from technology studies the practice of understanding the term 'users' as those interacting with a technology—in our case, an interface (cf. Oudshoorn & Pinch, 2003). This enables us to treat a variety of actors more symmetrically without using labels that presuppose that those in the museum are producers and those outside are consumers. It also heightens our awareness of potential changes in existing configurations of users and images as interfaces.

Our argument is threefold. First, we demonstrate that images become increasingly active objects, which have many functions besides being viewed. This leads to a revised concept of how to interact with an image. This has consequences for how museums then think about images in situ. Second, we argue that images as interfaces provide a networked context for digital knowledge, creating the conditions that can lead to interactions

that exceed the limits of single images, single collections or institutions, and even of single platforms. This has consequences for how museums view their role. Third, having images as interfaces reinscribes museums and other institutions in contemporary visual culture where media coverage and user-generated content is increasingly relevant.

The Image as Interface

How can we understand the fact that the images are not only the main material presented in a museum but are themselves increasingly multi-layered objects on which to act in order to access knowledge? First of all, the particularities of the visual culture within museums need to be taken account. According to Hooper-Greenhill (2000), museums have always ascribed a large role to the visual because of their focus on the museum collection and the visual display of objects: "The power of display as a method of communication lies in its capacity to produce visual narratives that are apparently harmonious, unified and complete. These holistic and apparently inevitable visual narratives, generally presented with anonymous authority, legitimised specific attitudes and opinions and gave them the status of truth" (p. 151). Hooper-Greenhill argues that "display" practices tend to enforce one-way communication and are difficult to modify because they are built into the structures and practices of institutions. Simultaneously she notes that more recent trends emphasize two-way communication, more openness to the voices and expertise of visitors and users (Hooper-Greenhill, 2000; see also Jörgensen, 2004; Simon, 2009). In addition, other tools and settings that also support such trends (such as information infrastructures, digitization, and new kinds of platforms for Web-based interactions) are now being integrated into museums. The material culture of institutions is therefore changing in response to the use of digital images, which have a particular physicality and, like printed photographs, require an adapted environment for preservation, manipulation, and display (think of servers, scanners, screens, and lighting conditions). Our analysis therefore considers change and continuity in the use of images for knowledge production in and about museum collections.

Modes of visual mediation are clearly influenced by material culture and historical trajectories in museums. In the case of the Tropenmuseum, the focus on the visual is deeply ingrained in the organization's digital archiving practices. The museum divides these practices into three levels: the first level is "basic registration," which is followed by "registration" and "documentation" (Beumer, 2009, p. 9). The production of "digital images of physical objects" is a crucial element of basic registration. Earlier, analogue ways of documenting the collection used "paper documentation" in the form of various kinds of inventory cards, sometimes accompanied by an explanatory drawing (p. 9). The Tropenmuseum also has a long institutional tradition of photographic documentation and has always had

a large number of analogue photographs of its physical objects. Ever since the museum started working with the Web-based collection database, The Museum System, both the paper documentation and the analogue photographs have been digitized with all of the information combined in digital media. The photographic collection has always been documented on inventory cards. These so-called UDC cards included copies of the historical photographs further annotated with a description of the scenes plus additional data relating to their origin (Beumer, 2009, pp. 32–37). One of the central aims of digital archiving in the museum is to make the collection more manageable, more accessible, and less prone to deterioration. The last is based on the hope that "the objects and [printed] photographs themselves [will] no longer function as an 'information system'" (p. 38). Digital archiving is therefore motivated by belief in the substitutability of digital images for physical objects as well as by faith in the information management gains to be acquired through digitization.

To varying degrees the Tropenmuseum uses conventions of a certain type of photorealism in the twentieth century about the mechanical objectivity of optical photography (Daston & Galison, 2007). With the shift to digital photography in a database setting, the hopes of replacing interaction with objects and printed photos by interactions with digital images became prominent. While there is a change in media, such a shift need not mean a break. Interestingly, Bolter and Grusin (2000) stress the dynamics of remediation between various media without positing breaks or revolutions created by different imaging techniques. This approach is sensitive to the specific ways in which digital imaging relates to optical photography and print-on-paper documentation. This points to the need to analyze the use of images in museums in terms of media history, though it is important not to forget that such remediation itself changes the context and meaning of images.

Our analysis of changing visual forms in museums and of images as interfaces embraces the visual culture in museums and digitization as part of the institutional agenda, along with an awareness of mediation that includes relations to users as well as attention to materiality or technology. In addition, we pay particular attention to the interactive functions built into visual material in databases as well as to the networked setting in which these images circulate. In today's museums, libraries, and archives, existing practices for the production, handling, and dissemination of images of objects are increasingly blending with new, networked technologies for visual knowledge production. Interaction and manipulation in a networked setting are integral to these practices, and they emphasize intervening rather than observing (Hacking, 1983; Lynch, 1991). The screenshots (figs. 1–5) exemplify how the image becomes an interface that invites interaction. The collections can be searched. For each item, there is a photograph and catalogue information—information that resembles

what was previously inscribed on catalogue cards. While the description is static, the image has built-in functionality. Users are invited to interact with it, either with the image itself in visual terms (zoom, crop, move) or with the image as a digital file in a networked setting (print it, e-mail it, preserve it). They can also make it part of their own selection and create their own space in the database. It is also easy to take it out entirely and have it travel to other settings and to other media—including this publication.

These possibilities are important for the way in which knowledge can be created. Furthermore, they constitute an understudied form of visual knowing. In their study of representational practices in scientific atlases, Daston and Galison (2007) identify intervention as an emerging mode of representation but only in relation to individual images. As we have shown, however, understanding these practices is not solely a question of looking at individual jpeg files, nor of narrowly tracing a shift from photographic to digital aesthetics. The databasing and networking of these images and the role that such infrastructures play within particular institutions are key elements in this new way of knowing.

We now turn to the specific way in which images as interfaces are embedded in practices in museum settings. In order to see both the difficulties and potential of such uses of images, we focus on skills that are needed to engage in these practices. This focus brings to the fore what
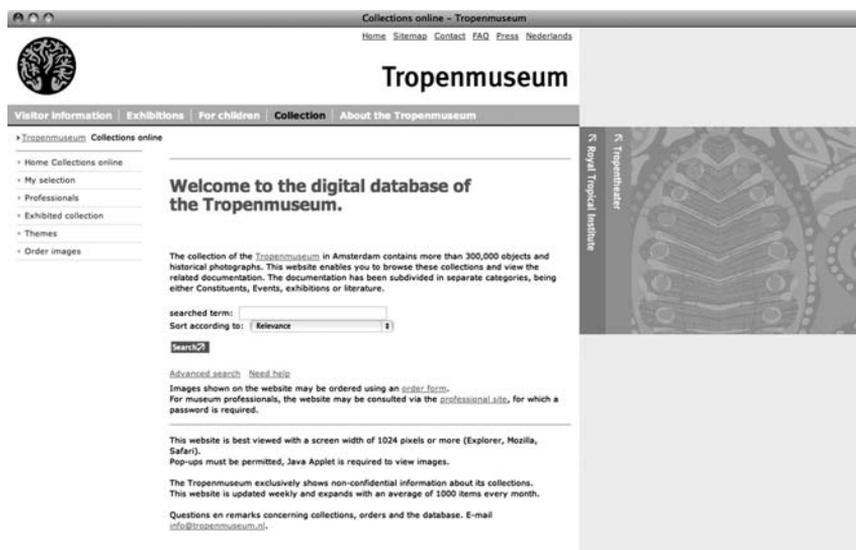

Figure 1. Screenshot of Tropenmuseum online collection database (http://collectie .tropenmuseum.nl/nindex.asp?lang=en)

Figure 2. Results of an advanced search, using the search term "vodou".

Figure 3. One of the items from the results page of the "vodou" search, displaying several possibilities for interaction with the image.

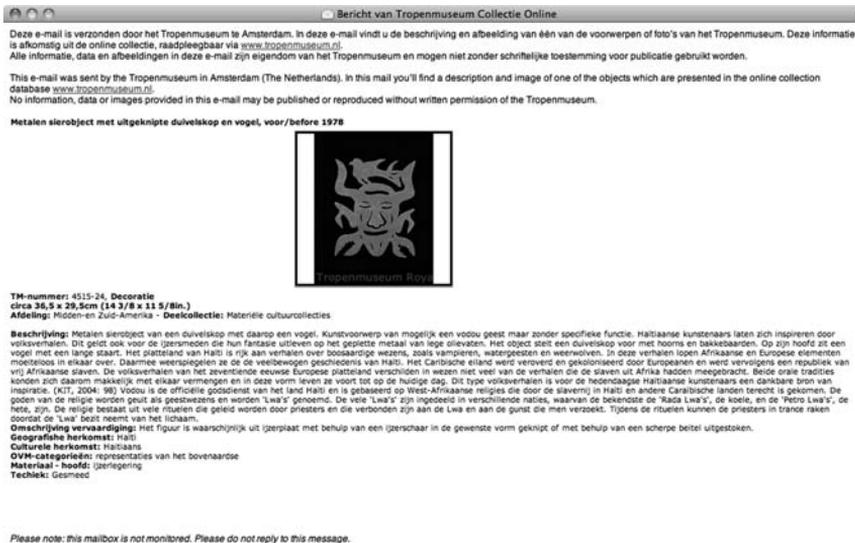Figure 4. The same image as in figure 3, after clicking on the zoom button.

Figure 5. The same image, after using the e-mail functionality displayed in figure 3. The image is accompanied by a selection of the annotations and descriptions on the object in the Tropenmuseum database.

people *need to* learn as well as what people *can* learn when engaging with databases of images in a multilayered, networked context. While skills are often deployed in combination, we discuss them separately here for analytic purposes. We first analyze the skills needed for seeing and interacting with networked images. This is followed by a detailed scrutiny of the skills needed for producing visual knowledge and for interacting with multiple platforms that support visual material. Finally, we examine how people develop skills that enable them not only to understand images but also to distinguish between various sources of visual information. We specifically consider a range of users inside and beyond the museum who use images as interfaces. This inclusive approach will enable us to consider practices in relation to images as interfaces without designating them a priori as inside or outside the museum or as involved in the production or use of knowledge. This opens up the possibility that these very distinctions are themselves being reconfigured.

Skills for Interacting with Images as Interfaces

Visual material has always played an important role in archival, library, and museum documentation practices. As is the case with everyday seeing, which is developed and trained by interaction in the world around us (Hacking, 1983), the skills used in interaction with visual material in institutions are also not simply there as givens. They need to be acquired and mastered. Importantly, existing practices and expertise help reshape the new skills needed for visual knowing and for interaction with digital images in a networked setting (cf. Hand, 2008). New interfaces mold and extend existing viewing habits (cf. Alaç, 2008; Daston, 2008). By focusing on changing skills, we are able to show that the transformations we describe are not simply a question of databases providing information effectively through digital media—as the modernization tale of computerization would have it. Rather, we are witnessing changes in how people interact with information, in the evaluation of what constitutes information, and, ultimately, in the production of knowledge. The skills needed to create and interact with these new interfaces help make meaning as a result of distributed actions between users and images. These actions are enabled—and perhaps sometimes also constrained—by the specificities and possibilities of a networked interface. A fundamental characteristic of networked practices of seeing is that the images are aligned on-screen with other digital material (Rubinstein & Sluis, 2008). Therefore, viewing skills alter not only when we move from analogue to digital imaging, but also as a result of this "windowed" and networked viewing (Friedberg, 2006). In addition, the specificities of working with/behind computer screens should also be taken into account (Alaç, 2008) as well as the ways in which different interfaces support different kinds of interaction with the visual material.

Actively Seeing and Interacting with Visual Sources

As part of our fieldwork at the Tropenmuseum, we interviewed most of the curators on staff, each with his or her own area of expertise. In discussing the role of images in their daily work routines, we identified the skills they needed to interact with the databased material. In the words of one curator:

> For the primary task of documenting and validating the collection, I absolutely need TMS. . . . In the past, the photographs of objects in TMS were not always of a very high resolution which hampered the use of the zoom function and this caused problems for some images, for instance when an entire sword is photographed and the photographer needed to step back to capture the object in its entirety. . . . In the past, the focus lay more on quantity instead of quality when it came to photographing the collection. In practice it turns out that you definitely need quality, otherwise you cannot properly examine the objects. The idea is that TMS facilitates scrutiny of the entire object and that it replaces a visit to the depot. In many cases the system indeed suffices, but if a marionette, for example, is only photographed from the front, it does not work for me because I need to see the side as well, to see the ornaments in the crown, because that gives me a clue as to which character I am dealing with.

In order to know this object visually, interaction with the zooming possibilities of digital photographs in the database is essential. The curator knows the interface and how to explore the object by changing the resolution on the screen. In some instances these skills in interacting with digital materials prevail over the skills needed to work with the material objects themselves. The interfaces change the setting, tools, and objects with which the curators make knowledge. Yet it is important to consider that these skills are not limited to an individual's know-how. The episode above points to the ways in which the encounter with the digital image is only part of the network needed for skilled vision to work. Indeed, the potential of digital photography is not enough. The curator's ability to see properly, to see enough of the object, and to apprehend it in sufficiently detailed views, depends on the particular instantiation of digital technology that was implemented in the institution. A "focus on quantity," which was the result of institutional priorities, affects the possibilities for looking at and knowing the digital image. Institutional decisions on how to pursue digitization affect how the user is able to see and learn from an image.

In many cases, the Tropenmuseum curators worked at other ethnographic museums before coming to Amsterdam. When the curator mentioned above started working at the museum, one of his tasks was to develop a new museum section for his area of expertise. Institutional responsibilities, infrastructures, and particular areas of expertise all shape interactions with digital images:

> Curator: "I worked at another ethnographic museum for 14 years and knew my sub-collection by heart which partly had to do with the fact that this was a collection of 'merely' 17,000 objects. In the Tropenmuseum, my sub-collection has three times this amount of objects. . . . In the beginning, I had difficulties finding out what exactly was in the collection and what I could use [for the development of the new section for which he is responsible]."
>
>   Ethnographer: "And that had to do with the amount of objects?"
>
>   C: "Yes, but it was also related to TMS. . . . Right now, I cannot tell the difference anymore, but back then I felt that there was a difference in search terms. I couldn't use the terms I was used to in my former workplace, I really needed to make a shift. For the new display I also did not want to use the most famous objects. But I did not have enough time to pull this off so I only partly succeeded."

The curator believes that this partial success not only had to do with the contextual use of keywords but also with the intricacies of the process of changing from analogue archiving to working with a digital image database:

> C: "A number of objects are not yet photographed or were not photographed at the time. So from time to time I now see things and think: 'Oh, this would have been something I could also have used.' But this simply has to do with the fact that we've been working through the backlog [*inhaalslag*] these past four years."

This exchange reveals different ways of interacting with the images in the database. The predominant mode is through keywords attributed to the various objects. Such an approach is almost too banal to mention being so fundamental to the indexing and information retrieval systems that have been central in museums for the past century. This mode of interacting with information, and therefore with objects, is perhaps dominant in digital databases that are efficient at manipulating information in this specific way. Note, however, how a different interaction with the database leads to different knowledge about the collection. "From time to time, I now see things . . ." points to a browsing behavior that leads to discovery, where one first sees something and then knows it. This contrasts with already knowing a relevant category, name, or keyword, and then calling up the image of the object to look at it.

This example illustrates two important points about the skills deployed in the use of visual material in databases at the museum. First, effective use of digital information sources require a specific sensibility to the particularities of databases of collections. Their size, the quality of images, and the way in which digitization was implemented are all elements that shape how users can interact with the visual material and must be taken into account: users must learn to see in context (Alaç, 2008; Goodwin, 1995). While much of this contextual knowledge may remain implicit in day-to-day activities, our fieldwork enabled us to make clear that when us-

ers know about the mediation of images, they are better able to see with them. The second important element illustrated by this interview is the way in which interfaces shape what can be known. Searching on keywords will call up certain images for further consideration, but this strategy relies on a priori knowledge of relevant keywords. An interface that supports visual browsing would enable "seeing" to precede or to stimulate formalized knowledge of labels and categories.

Skills for Producing Visual Knowledge and Interacting with Platforms
In this section, we turn to the ways in which particular platforms that support visual material have come to be used at, with, and for the Tropenmuseum. The cases discussed here enable us to address the changing skills of individuals and of institutions, the former through visual "user-generated content" (Cox, 2008; Petersen, 2009; Van House, 2002) and the latter through the interaction of the museum's collection of images with other platforms.

The Tropenmuseum recently became a partner of the Wikimedia Foundation, the organization behind Wikipedia and the Wikimedia Commons. This cooperation developed in the context of a project called Wiki loves art/NL (WLANL). The initiative sought to stimulate amateur photography in museums with the goal of getting more photographs of cultural heritage on Wikipedia pages under a Creative Commons license. In June 2009 a group of forty-six museums in the Netherlands opened their doors to the public for special sessions that allowed participants to make photographs of designated objects from their collections. Participants uploaded their images on Flickr, which thus served as a conduit for the photographic material. A jury, consisting of the organizers and a number of museum employees, decided which photos would subsequently be used on the Wikipedia pages and who would receive an award for "best photo."

In a blog post on WLANL, U.S.-based museum exhibit designer Nina Simon noted that participating museums were especially interested in making their content digitally accessible without breaking any copyright laws, while the Wikimedia foundation was primarily involved to obtain useful data (Simon, 2010). Many photographers were more concerned with "freely making pictures for their own use (or their portfolio)" and "quite a few came to do their own thing and they had ample opportunity to do so" (de Lusenet, 2010), as one of the Dutch participants pointed out in reaction to Simon's post.

Clearly, multiple interests and motivations were served by this event. What is relevant for our purpose is that the circulation of images via these platforms makes possible multiple uses and appropriations without causing them. Flickr serves as a pipeline from amateur photographers to Wikipedia, while institutional actors (from Wikimedia to the Tropenmuseum)

maintained a gatekeeper function. Not only do we see a shift toward the digital in the material structures that support storage and display of photographs, but in this case both personal and institutional visual resources take the shape of networked databases. There are of course differences in the way various databases (TMS versus Flickr) are set up, and in their different possibilities for interaction, but nevertheless we see an alignment of the way visitors and institutions organize their visual knowledge about the museum.

Furthermore, the intersection of the multiple agendas of museums and of visitors via Flickr and Wikipedia points to new ways of negotiating what it means for a digital image of a museum object to be or to become public. A photograph in this initiative was treated as a creation to share with other viewers; an opportunity to document the collection; and the production of copyright-free data. The WLAN activity reconfigures the public/private dynamics of visual knowledge in interesting ways: the museum opens its doors for a *private* session for amateur photographers; amateur photographers make their personal snapshots public; and there are complex shifts in ownership, copyright, and right to publicize, as the images are produced, uploaded, selected, and further circulated. The ways of working of different groups become aligned in this project. The skills of amateur photographers for producing visual knowledge about the collection is linked to the aspirations of the museum and of Wikimedia for greater production of copyright-free images, while the photographer's work is arguably enhanced through the visibility it gains in the course of this interaction. Different parties use each other to leverage a greater impact of their own skills.

A second example of the different kinds of interaction with platforms that support visual material also involves Flickr, but was initiated by visitors to the Tropenmuseum. As part of our fieldwork on the practices involved in the Tropenmuseum networked image database, we interviewed the moderator of the Tropenmuseum group on Flickr. Also taking part in the interview was his girlfriend, an enthusiastic amateur photographer herself. Both the moderator and his girlfriend carry their cameras with them whenever they can. This was also the case when they went on their first visit to the Tropenmuseum about two years ago. The couple continues to go back to the museum on a regular basis. Both are enthusiastic users of photo-sharing opportunities on the Web. After their first visit to the museum, the moderator wanted to upload to Flickr the photos he had taken. He explained that this was not in an attempt to advertise the Tropenmuseum, but simply because of his interest in photography, though he also partly ascribes this to his professional background as a teacher. He likes to inform and educate people. In this case he does so by writing annotations to the photos, for instance on particular exhibitions. At that point, he noticed that no Flickr Tropenmuseum group existed, although

there were other users who uploaded photos of the Tropenmuseum to Flickr. He decided to create a group called "Tropenmuseum," and deliberately opted for an open structure by not creating strict rules for joining the group.

As to the skills needed to produce visual knowledge and interact with platforms like Flickr, the moderator remarked on the policy of the use of tripods not being allowed in the museum. This means that visitors are not likely to use long exposure times without a tripod, because they need to resort to other photographic means to capture the often stark differences between dark backgrounds and the beautifully lit objects on display. This is one way in which the Tropenmuseum itself shapes the kinds of photographs (and we would argue, photographers) who create visual material about the museum.

Interestingly, the moderator also referred to another, nonphotographic skill that he developed while working with images as interfaces. By uploading his images to Flickr and by serving as the moderator of the Tropenmuseum group, he was stimulated to expand his network beyond national borders, even though he was not at first fluent in English. Because part of this network is now made up of international contacts, his use of English has greatly improved. After a while, he told us, he even started to think bilingually.

In the case of the Tropenmuseum, the interfaces offered by the networked image database, but also by platforms such as Flickr, can be seen as creating sites of new literacies and creativities (Burgess, 2009; Petersen, 2009) that redefine the role of cultural producers (Bruns, 2008; Jenkins, 2006). As we have seen, Flickr provides a space for interested museum visitors to share their photos, to add reviews of the exhibitions they went to, and to provide descriptions of parts of the collection on display that caught their eye. The Flickr group serves as an open, accessible podium for interaction and exchange, while the photographs act as interfaces for an international group of interested users, brought together by one enthusiastic moderator. These and other participatory new media phenomena, although diverse, play an important role in shaping various aspects of knowledge production. In the case of Flickr, the conjunction of different photostreams and, importantly, metadata, annotations, and descriptions may in the long run lead to a renegotiation of epistemic authority in relation to different types of visual material. The co-existence and closeness of various understandings of images on the Web make it all the more important to analyze what enables us to determine how images can come to be trusted and to be useful and how to generate instances of such trusted and useful images.

*Skills for Evaluating Visual Knowledge: Making Connections Is
Making Distinctions*

We now turn to the third important component of the skills needed to en-
gage with images as interfaces: the ability to not only understand such im-
ages but also to distinguish between various sources of visual information
that they represent. We start by focusing on how judgments about trust
and use are made in the work of registrars at the Tropenmuseum. Their
job is to gather, register, classify, and document the images and to provide
the information that is to be put in the museum's collection database. We
observed that in using and working with the database, registrars spent
a lot of time and energy making connections. They used handbooks,
Google searches (including those on image files), atlases, digital maps,
classical works on countries, dictionaries, etc. They translated informa-
tion on older inventory cards into the database, and they revealed a good
memory for what is on display in the museum currently and what was on
display in the past.

In the course of their work, registrars constantly query the TMS data-
base using keywords related to people, geography, and objects identified
on inventory cards in order to establish links ("relations") between sepa-
rate records in the database. In addition, they also regularly scan images
in books so that these can also be added to the database. They relate infor-
mation at different locations and on different support media (inventory
cards, database, printout, books, their memories). The creation of links is
supported by the ability of the database to respond to queries and by the
possibility of adding to the material in the database by means of digitized
files, notes, and extra keywords. But the creation of each link also relies
on the registrar's judgment about the relevance and reliability of the in-
formation involved and his or her knowledge of museum resources both
inside and outside the database. For instance, one registrar whose area
of work is the photo collection used his own snapshots taken on visits to
Yogyakarta to localize buildings and pinpoint geographical markers on
historical photographs in the museum. He thus enriched the museum
records by using his own visual material stored on his PC along with his
knowledge of the subject involved.

While in our research we witnessed the intense combination of mul-
tiple visual resources, we also noted that there are hierarchies and pref-
erences for particular kinds of evidence and sources in making connec-
tions. After we asked the registrar if he had ever considered uploading his
own photographs to the museum database, he answered that he thought
this would be going too far. This example reveals a distinction between
visual material used as a trusted resource and the material that is actually
included in the museum collection. We have observed that images of ob-
jects or digitized photographs in the collection come to be at the center
of a web of relations in the database. But the relative authority of different

kinds of materials is important. Some images are "tools" (the registrar's own snapshots) and others are "material" (the images of objects or photos in the collection). While there may be an increasing tendency to make connections as a result of working in a database setting, there are still hierarchies in the kinds of material that curators believe are worth connecting to. The ability to deal with information sources is a long-standing ability for museum professionals (Marty, 2008, p. 83), and as this example shows, this skill is dynamic but grounded in museum traditions: it adapts to new connective possibilities of information technologies while maintaining distinctions between sources.

The skills used to link and make judgments about connecting visual (and other) sources are not only changing in the museum. During our fieldwork in July 2009, the Tropenmuseum started featuring an "object of the month" on their website. A photograph of a relatively unfamiliar object is selected from the image database and uploaded. In an accompanying text, users are asked to provide information on the object. A new object is introduced every month via Twitter, digital newsletters, and blogs. Typically, new projects like these that are explicitly aimed at involving new users via images as interfaces tend to be initiated by the PR department. In this case, "the object of the month" is selected in close cooperation with the Collections Department and the museum curators who decide which object is to be selected from the database. The criterion is that not much is known about the object by museum experts, and the intention really is to learn from users. On the webpage there is a "react" button that can be used to post reactions.

Our analysis of the interactions with the images that took place from the start of the initiative in July 2009 reveals, first of all, a particular pattern in the kinds of reactions participants post on the website. About half of the reactions can be categorized as expressions of individual sentiments or as comments on esthetic elements relating to the object ("I think it has African roots and has something to do with voodoo. It looks really scary!"). The other half of the posts focus more on the actual "assignment" and attempt to identify or classify the object ("To me, it looks like an Ekoi mask, used by natives of South-east Nigeria. The mask is usually worn on top of the head, is covered with animal skin and is probably part of a secret egbo society").[1] Although the photographs are obtained from the Web-based collection database, there is no direct link to the database records themselves. Users are not provided with the metadata and annotations that form part of the database record nor is searching for this information in the database facilitated in any way. In an attempt not to "bias" the users, the photographs and the objects on display are deliberately stripped of their context. Nevertheless, quite a few users are particularly interested in obtaining (parts of) this information. They post reactions asking for information on the actual size of the object and feel they cannot categorize

the object without this data. In another, more recent use of the Web to obtain more information about collection items, the Tropenmuseum has placed photos on Flickr (2010) in a much more contextualized and networked manner. This initiative has been successful in gathering information about the people in the photos and the circumstances of the making of the photos. This suggests that the images need to be related to, or at least partly embedded in, "a web of evidence and practices that produce what we take to be evidence" (Barad, 2007, p. 53) for the images to trigger the production and exchange of information.

We take these examples to point to the partial reorientation of users' skills in dealing with information sources both inside and outside the museum. While there may be cases where images are configured to stand on their own, such as in gallery exhibition or some forms of Web-based presentation, these examples highlight the need to take users and their expectations seriously and to pay attention to the networked image as an emerging cultural logic.

Consequences for Users

Thus far, we have discussed several examples of the ways users encounter, use, and generate networked images of objects in museum collections. We have done so through the lens of the skills needed to interact with the images and the skills needed to produce and evaluate visual knowledge via this interaction. We now turn to the consequences of these visually mediated interfaces for users of this digital knowledge and in particular to the consequences for the role of museums.

One of the corollaries of the increasing use of networked images as interfaces is a new, more distributed and connective approach to "what is the collection." This contrasts to the more "monolithic" approach that was especially visible in earlier discourses that focused for the most part simply on "digitization" and on museum practices focused on taking up the collection into the database as a linear process made up of discrete steps.

This development is clearly visible in the case of the Tropenmuseum. The museum is cooperating with many other organizations on a national and international level by making the Tropenmuseum collection available on other sites via Web-based image databases, platforms, and portals. For example, the entire collection is accessible through the SVCN website (Stichting Volkenkundige Collectie Nederland) and part of its collection is available through the Atlas of Mutual Heritage database, an image database on the Dutch East and West India Company. The museum also participates in the Asia-Europe Museum Network (ASEMUS) and its website contains a portal to a "virtual collection of masterpieces" (n.d.) a selection of twenty-five masterpieces from each of over sixty museums. Recently, the Tropenmuseum collection on the Netherlands Antilles and

Aruba was made available via Het Geheugen van Nederland (the Memory of the Netherlands). Further collaborations with Wikimedia about the history of the Maroon people of Surinam and Indonesian culture have been developed. While the scope of these collaborations varies, some include tens of thousands of photographs from the Tropenmuseum that have been integrated into other platforms. Because of the setup of some of these platforms, the material circulates evermore widely: Wikimedia serves as a pool from which users of Wikipedia draw to compose lemmas.

It is also clear from our analysis that while such connections and multiple sites diversify the presence of the Tropenmuseum, this need not be a source of anxiety about loss of identity. For example, in the first meeting held at the Tropenmuseum with a representative of Wikimedia Commons on a possible cooperation, the head of collections stressed that, although the museum was positive about the idea of working together, he deemed it crucial to distribute only high quality photographs. Both parties agreed that museum collections of images represent high-quality material and, significantly, that the images contrast with other kinds of otherwise abundant digital images. The Tropenmuseum's images were considered to have a particular and valuable temporal context (historical material and not snapshots), cultural provenance (Dutch), and international scope (internationally relevant content) (Gerardm, 2009). This is an interesting observation since it further documents how the functional convergence of various resources is developing (Marty, 2008). It highlights the fact that the digital format of the images and their widespread circulation on platforms like Wikimedia do not erase distinctions. Even when integrated on platforms such as Wikipedia, they maintain a distinct identity that is established in relation to special features (such as "high-quality," "historical" material).

A more distributed and connective approach to the collection may lead to increasing opportunities for new forms of knowledge production. Building on existing practices of interactions with museum collections via Web-based databases, museums are increasingly interested in using images as interfaces. Because images in collection databases are part of a large volume of visual data, accessing this information requires a certain level of proficiency in database use and knowledge of relevant search terms. A more distributed approach to the collection allows users to see and interact with the images on platforms that are easily accessible for those accustomed to interacting with Web-based encyclopedias, search engines, and social networks. This does not leave the conception of "the collection" unchanged. The connections created on a variety of platforms further open up the collection to a much broader group of users than hitherto, and it may also lead to unexpected, more associative ways in which users access and interact with museum knowledge. Our fieldwork has confirmed the trend toward "post-museums" described by Hooper-Greenhill (2000).

The Tropenmuseum is increasingly allowing for diversification and distribution of museum knowledge and is becoming more inclined to let other voices speak in their collection. Our work stresses the role of networked images in this process. By linking the museum images to other images, to other kinds of information, and to a wider array of users, the museum is supporting new opportunities to co-create narratives about its collections by both museum experts and other users.

The establishment of lateral connections to other museums and to Web-based settings could also lead to increased visibility of the museum collection. This point becomes apparent in the engagement between museums and platforms like Wikimedia Commons and Flickr. Museums have tried to make room for users within their sites by providing functions like "my collection" as a place to "store" users' favorite items or search results. This is also true of the relationship between Flickr and the Tropenmuseum. Flickr becomes a space where users can express their affective relationship with the materials of the museum. Yet Flickr can also be a site for even greater expressions of attachment where users can post materials intended for other users and not primarily for themselves, though some museums are adapting their sites to enable social networking software functionalities. Furthermore, rather than relating visitors interests to existing images in the museums' collections, Flickr enables visitors to make or modify their own photos, often presenting them in situ in exhibitions. These interactions create images that are both constitutive and telling of the users' relations to the objects, exhibitions, and museum. The diversification of the way the Tropenmuseum's collection is presented and appropriated through the making of new connections can therefore be seen as an extension of the proposal for "distributed collection building" (Jörgensen, 2004) since it embraces decentralization and distribution as important strategies. This is part of a trend in which images as interfaces provide a networked context for digital knowledge, creating the conditions that can lead to interactions that exceed the limits of single images, single collections or institutions, and even single platforms. Such changes require careful analysis and reflection on the part of museums and cultural institutions, not only in terms of their own institutional needs but also in terms of their positioning as cultural institutions in contemporary visual culture.

Conclusion

Our analysis shows how images have come to constitute a particular form in the circulation and production of museum knowledge. A better understanding of how users encounter, use, and generate these images must include careful attention to the databased and networked aspects of images and to their functions as interfaces. These are related, but not reducible, to their digital status. We emphasize analyses of the new possibilities pro-

vided by digitization for knowledge creation. Writing about the Tropen-museum, Navarrete states:

> A digital collection is not a digital copy of records about the objects in the collection: it represents the creation of new forms of records to explain the objects. The knowledge about the objects has multiple dimensions, just as there are multiple contexts to explain them. The digital joint repository is merely the tool to unlock the collections. The work of the museum begins then, creating new meanings and developing new presentations to share the knowledge and exchange among cultures in the world. (Navarrete, 2009, p. 78)

Since digitization is not *simply* a translation, it is crucial to consider what the new possibilities are that the process of digitizating material creates and embedding it in a new context. As images become interfaces, the dynamics of knowledge production change. We have shown in our analysis how the database material time and again gets connected to other images, whether from print-on-paper reference books or from user-generated (such as holiday) snapshots. These observations remind us that the database, like any other sources of authoritative knowledge, is most effective when it remains in dialogue with other sources. Furthermore, these relations are not entirely determined by infrastructures and technological possibilities: embodied users remain important actors in such dialogues. As we have seen, particular skills are required of users to pursue and constitute connections. It is therefore crucial not to reify the database and equate it with the knowledge of the museum just as it would be shortsighted to see the use of digital and networked technologies as simply representing the material objects. The concept of image as interface therefore emphasizes the possibilities for interactive knowledge creation through and beyond the digitization efforts of museums and of their visitors. Our analysis undermines the fantasy of digitization as a linear and discrete process and highlights the performative aspects of visual collections in the hands of users. Emergent and distributed museum knowledge becomes visible when the interaction, distribution, and circulation of knowledge about and by images are analyzed.

The image as interface also has a number of very practical consequences for museums. As images become increasingly active objects that have many functions besides being viewed, this should lead to renewed attention to how images are made available. For example, we noted above that images are often only retrievable through keyword search. Other database designs that allow greater browsing freedom could enable users to engage with this material differently, through less reliance on a priori knowledge of keywords or tags. There are projects in this direction,[2] and our analysis indicates that they would be welcomed supports for knowledge production.

We have also seen that images as interfaces provide a networked context for digital knowledge. The way images become connected for and by

users leads to interactions that exceed the limits of single images, single collections or institutions and even of single platforms. This has important consequences for how museums view their role in that it can seem to be both a threat and an opportunity. First, the lateral connections to other cultural institutions and to Web-based settings can be seen as signs of the increasing relevance of museums in contemporary visual culture. This could mean not only increased visibility, but also increased opportunity for new forms of knowledge about the collections. As Jörgensen has argued, digitization could also extend a distributed model of collection-building (2004). Our analysis of the involvement of the Tropenmuseum with platforms like Wikipedia and Flickr shows that there are both increasing technological possibilities and user interest in creating links between items. Together, these can lead to "distributed production of new knowledge and the stimulation of new creative endeavours" (Jörgensen, p. 463). We have also shown that institutions can shape how they and their collections are perceived through the extent to which their digitization policies reflect a focus on quality or on quantity. The way images may be offered as part of the museum's knowledge or as separate from it affect how the user is able to see and learn from them. Interaction with digital sources and connections requires a specific sensibility, and museums may need to pay more attention to their role in shaping this sensibility to encourage engagement with their collections. For example, working with user-producers or with bodies such as Wikipedia may require a new set of skills and experiences on the part of museum professionals. In other words, new forms of work that pay attention to the connections between media, knowledge, and engagement may become increasingly important for museums.

Our analysis speaks to the discussions that have been taking place on the convergence between cultural heritage bodies (Navarrete, 2009, p. 78). The interactions between Wikipedia and the Tropenmuseum and our discussions with users suggest that if there is indeed convergence in terms of some functions, there seems to also be an enduring differentiation between the visual materials made available by the different sources. In other words, while there may be an intensification of connection and circulation of material, the situation is not one of a melting pot where differences between sources are flattened. The images of the Tropenmuseum remained distinct in the eyes of its users and even in the eyes of Web-based, open-access initiatives such as Wikipedia. This is an interesting dynamic of digitization where increased intensity of connection does not mean loss of identity. Finally, the multiplication and increased circulation of images on the Web do not result in a perception of the equivalence of all images. Precisely because of the co-existence and closeness of various images, it is crucial to continue our work to investigate what enables users to determine and generate instances of useful images that can be trusted.

NOTES
1. These comments belong to the July 2009 object.
2. The Fashion and Apparel Browsing for Inspirational Content (FABRIC) project is a good example. The project is the result of a partnership between Annette A. Ward, Stephen J. McKenna, and other colleagues at the University of Dundee, with the Victoria and Albert Museum and fashion house Liberty (University of Dundee, 2008).

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