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KEYWORDS: Craft research, non-traditional research output, research communication, scientific visualisation, video article.

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Rethinking the Academic Artefacts

By Gunnar Almevik & Jonathan Westin

INTRODUCTION

The realm of craft is the processes of making, and craft research is characterised by using practice in the pursuit of an idea, a question, or a problem. Consequently, the communication of craft research needs to substantiate the process of making: its motion, sensation, vision, and haptic experience. In contrast, though it could be argued that modern science has always been the systematic description of such characteristics, the academic system is very much reliant on textual output. As a result, the mainstream academic process focuses on the production of written descriptions through various outputs of textual genres, such as full research articles, conference papers, technical reports, case-studies, reviews, books, and research applications. To conform to these genres, the studies or projects need to be translated into words, a process further disciplined by the accepted disposition and rules of the format. If there are any directions for visual material, these are generally limited to the number of illustrations allowed, and the size and format of the digital file. The few existing journals with outspoken aims to publish craft research, such as *Craft Research Journal*, *Journal of Modern Crafts, Journal of Intangible Heritage*, *Studies in Material Thinking*, *FormAkademisk*, and *Techne Series*, are essentially mainstreamed and text-based.

The methods of crafts are explorative and systematic in similar ways to the making of scientific research. Pamela Smith's work underpins scholarship in the area of craft. In her research, she discloses how modern science is indebted to craft sources and craft knowledge making (Smith et al. 2017; Smith 2018). Bertil Rolf makes the same observation but argues that, while the processes are the same in sciences and master crafts, the outputs are different (Rolf 1991; 2017). The craft masters' knowledge making is a means to skilfully and efficiently produce, while scientific academic produc-

tion aims at new knowledge per se. The traditional craft outputs—the furniture, textiles, or buildings to name just a few—attend to clients' demands and praxis of the guild but they don't usually declare how they were made, which questions arose during the process, or how those problems were solved. When traditional crafts now enter the academic society, the craftspeople have to produce a new kind of output and attend also to the praxis of academic society. This may be a major challenge for a practitioner researcher.

This chapter concerns the assessment and communication of science-based craft research, with particular focus on how procedures and formats may be adapted to better serve the communication of evidence-based craft research. Extensive research exists on multimodal methods for data collection and data analysis in the field of craft research, for instance how film may disclose craft skills or embodied knowledge (Wood 2006; Almevik, Jarefjäll and Samuelsson 2013; Gowlland 2015; Groth, Mäkelä and Seitamaa-Hakkarainen 2015) or how 3D representations may assist in the exploration of materiality (Chittenden 2018). Craft research has also picked up and adapted methods from other areas like time-geography (Eriksson et al. 2019), dance notation (Høgseth 2012), quality content analysis (Andersson and Johansson 2017), and olfactory description (Källbom et al. 2018) to better capture the modality of craft making. What is less attended to is how to integrate the multimodality of these methods and new technologies in the actual research outputs. What is required of a film, a 3D model or an interactive application as a research output? What scholar norms for research communication must be attended to? How can these new technologies be disciplined in a way that bridges the double-folded demand of rigour and relevance? This chapter presents a review based on literature, scholar debate, and practice cases of assessment and communication of multimodal and non-traditional research outputs. The aim is to point at possible paths for researchers and doctorates as well as supervisors and reviewers to follow in the making and assessment of research outputs in regard of craft research.

NON-TRADITIONAL RESEARCH OUTPUTS

Differentiated Needs in Craft Research

The opportunities for publishing craft research, maintaining its full breadth and depth, depend on the character of the research. Craft research is conducted in different academic disciplines and subject fields and with distinct perspectives and approaches (Almevik 2017; Kokko et al. 2020). By far the most common type of craft research published in books and journals could be referred to as research *into* craft, referring to Herbert Read (1955) and Christopher Frayling's (1993; 1997) characterisation, where crafts are subjects to be looked into from an outsider's perspective, or to be scrutinised with a meta perspective. This craft research has a longstanding tradition in art history, archaeology, ethnology, and anthropology, and with research interest for the history, meanings, discourses, perceptions, expressions, or functions of crafted objects or craft subjects. Research into craft is comfortable in the traditional forms for research communication and there also exists a broad range of journals where craft is considered to be a relevant case or phenomenon for study, be that within archaeology, heritage studies, conservation, or anthropology.

The kind of craft research that is focused upon in this chapter, and that also has particular needs for multimodal research communication, has been referred to as *practice-led research* (Rust, Mottram and Elshaw 2007), *practitioner research* (Pilkington 2009), *experiential research* (Niedderer and Reilly

2010), or research *through* craft (Frayling 1997; Gray 1998), where the craft practice plays an instrumental part in an inquiry. This craft research often demands augmented means to represent the nuances of procedures and qualities in practice to underpin the results; a film may be essential to display variants of a motion or to substantiate the analysis of sensory affect; a detailed 3D model of a tool, material, or construction may be essential to outline the inquiry. The formal delimitations of the accepted research outputs may thus affect the credibility and stringency of the research.

Traditional Sciences and Artistic Research

There is potential within the academic system to describe a research process through non-textual outputs that might better capture important nuances of the craft practice, and which might also better encourage the development of pioneering fields of research. Since the mid-1990s, visual anthropology has developed perspectives and approaches not only to study visual representation but also to use new media to perform research (Sullivan 2010; Pink 2011). Furthermore, today, new technology offers a wide range of formats that can enhance research communication and reduce the loss of information in translations between modes, medias, and formats. The latest turn in informatics, digital humanities, and multimodal anthropology explores how gaming, social networking, and immersive or augmented reality technologies are reshaping societal practices including, as well, the practice of research (Gubrium, Harper and Otanez 2015; Pink et al. 2015; Collins, Durington and Harjant 2017).

The most ground-breaking approaches have been developed in artistic and creative fields in Arts and Architecture (Mäkelä and Routarinne 2006; Nelson 2013; Nilsson, Dunin-Woyseth and Janssens 2017; Solberg 2017; Wilson 2017) in a European perspective driven by the 1999 Bologna process to harmonise higher education in three cycles to doctoral level (Bologna Process 1999; 2003). The concept of non-traditional research outputs, with the acronym NTROs, involves original, recorded, or rendered creative works and curated public exhibitions and performances. The NTROs have a stronghold in artistic research and have to some extent earned wider academic recognition. Research councils and national assessment bodies in Australia and the United Kingdom have, for instance, come to include NTROs in guidelines for assessment of research and also systems for data management (ARC 2014; University of Sidney 2014; Barwick and Toltz 2017). The *Society for Artistic Research* (SAR) has launched the *Research Catalogue* (RC), a database for artistic research where sound, images, video, and text can be combined in an integrated format for presentation.

However, the systems for publishing artistic research are no open and shut cases for craft research; many craft subjects are organised in faculties of technology, pedagogy, natural sciences, or cultural sciences, and are directed to traditional forms and systems for publishing. The division between the traditional sciences and artistic research is substantiated by regulations, separating for instance the qualifications of Doctorates in the Arts from the common science-based [in Swedish *vetenskaplig grund*] Doctor of Philosophy. The divide is augmented by the sundered academic cultures, one side with scepticism that traditional research and formal frameworks harm the characteristics of the creative practices, the other side fearing that the diverse and flexible artistic research will dilute the concept of research (Borgdorff 2012; Solberg 2017, 245; see also Prop 2008/09, 134).

The "Sui Generis Perspective"

The NTROs are often compromised between, on the one hand, the mainstream text-based formats for research communication, and, on the other hand, the strongly individualised and somehow inscrutable artistic forms of communication. In the artistic research tradition there is a strong line of argument that the inquiry and thinking is an amalgam, embodied in the output. In the Nordic countries, the incorporation of arts and creative practices into doctoral education emphasises a research perspective that Henk Borgdorff has referred to as a "sui generis perspective" (Schwab and Borgdorff 2014, 148) and Christopher Frayling names "research *for* the arts" (Frayling 1993, 5), where the fine, applied, and performing arts are advocated as a class by itself. The artwork and masterpiece that is defined as the research output may be immovable, irreplicable, or even ephemeral in an event that occurred just there and then and totally disclosed from here and now. The skill of representing the artwork or masterpiece in a way that allows it to be distributed and shared is not consequently regarded as a necessary possession of the creative researcher (Almevik 2019). When, for instance, the Swedish Higher Education Authority (UKÄ) evaluate the quality of education and research, they acknowledge "other non-verbal ways of expressions" in scholarly work. In the official conclusion of a large evaluation of degrees in arts, craft, and design, UKÄ criticised universities for not possessing better competence for documenting students' independent work (UKÄ 2014). Through their wording, this competence is regarded by UKÄ as an institutional responsibility rather than a necessary skill of the student or researcher. Regardless of discipline, many researchers may agree that doing research and writing an article of the research are different processes, but the writing is not something that can be outsourced from the research. The research continues throughout the process of peer review until it is published. A researcher may get help through feedback from peer readers, translation, and proofreading. Furthermore, a research-group may have a division of responsibility where some contribute more to the writing, but the means to produce the research output is an integral part of the generic research skills.

The conception and frameworks for NTROs unfortunately focus only on the artistic outputs to which there are no discipline strategies. On the contrary, the Research Catalogue (RC) stated that their motive is to deviate from standards and to let the artist/researcher decide for herself/himself the visual disposition and the different media format(s) that they wish to focus on.[1] The NTROs are negatively defined as a non-traditional academic divergent. Robin Burgess, Repository and Digitisation Manager at the University of Sydney, points at the problems associated with the extent and heterogeneity of the material. The research communication becomes a data management problem when researchers hand in extensive amounts of material and all kinds of elements from their research process, like protocols, sketchbooks, logbooks, and photography repositories. Furthermore, the fussiness of the outputs which fall under the broad term of NTROs affects its academic status: "It can be stated that many people put less value on the contribution that non-traditional research provides for society. It might not be ground breaking scientific research, but what it can be seen as doing is enriching our lives and improving our wellbeing, providing us with an alternative way of thinking and invoking conversation" (Burgess 2017). While well-meaning, it is problematic if the NTROs are perceived as in-

capable of providing society with ground-breaking research. The research output is usually grounded on and referenced to a repository from the research process, but the repository and the output are not an equivalent. Anne Solberg, who has investigated the academisation of creative practices, points towards the necessity of developing research strategies for an "inside perspective" into the making of knowledge around creative practices. Nevertheless, she states that this integrity may not be achieved in isolation: "What is needed is to go for the position inside academia, building an epistemological platform inside the academy, and learning from existing academic disciplines when that proves to be fortunate" (Solberg 2017, 246).

ASSESSMENT OF RESEARCH

The Normative Structure in Science and the System of Peer Review

The use of *science* in this book does not exclusively refer to traditional natural science disciplines and the deductive hypothesis-driven research, often referred to as "the Scientific Method." In Nordic languages, science refers to the wider concept *vetenskap/videnskab/vitenskap* [Swedish/Danish/Norwegian], or *tiede* [Finnish], denominating the common academic production of knowledge that is not defined as artistic. Science is, in this sense, synonymous with systematic, academic, scholarly, or evidence-based knowledge. The word *science* is a noun but also implies the active verb to produce science through research. With a constructive perspective on knowledge, there are no universal laws to define science (Kuhn [1962] 2009). There exist, however, norms that are negotiated, accepted, and widely implemented in academic systems. Robert Merton's essay on the normative structure in science evolves around four concepts, *communism*, *universalism*, *disinterestedness*, and *organised scepticism*, also referred to as the Mertonian norms or CUDOS norms (Merton [1942] 1973). These norms recur in the creative practices as well, but also disclose epistemological disparities (Kaiser 2000).

Communism refers to science as a common good and a contribution to collective collaboration (Merton [1942] 1973, 273; see also Munafo et al. 2017). Research and systematic knowledge may exist in closure, but science is a creative commons that does not exist in a vacuum or concealment. The idea of an accumulative science has been disputed (see Kuhn [1962] 2009), but there is a wide acceptance that science has to be open for others to quote from and build upon. However, while a researcher needs no permission from the author to quote a statement from a scientific text, the reinforced copyright jurisdiction of visual expressions and artistic work may counteract the possibility for collective collaboration, and delimit the dialogue and transparent "hacking" of the arts and crafts (von Busch 2008). In creative research, the mediation of a tangible artwork or masterpiece is more frequently handed over to another person with technical skills; the filming, photographing, or programming. This position of dependence compromises both the authorship and communism of the research.

Universalism means that science should be independent of the situation, the individual context, or the socio-political context (Merton [1942] 1973, 270; see also Goodman, Fanelli and Ioannidis 2016). The idea of universalism recurs in the call for generalisability, objectivity, and repeatability as a claim that others should be able to come to the same result. The norm of universalism has been criticised from constructive and critical standpoints, contesting the idea of a purely objective and totally independent knowledge (e.g., Yin 1989;

Guba 1990; Strauss and Corbin 1998;). There are alternative concepts to universalism in science to better target the normative intent: the functionality of the results (Sjömar 2017), the confirmability and transferability (Niedderer 2009) or intersubjectivity within a community of practitioners (Kaiser 2000), or the connectedness to the reality of a practice (Molander 2017).

Disinterestedness is the exaction of an unbiased science (Merton [1942] 1973, 270). There can be no conflict of interest or crafting of science in a particular way to benefit a company or an individual. The increase of exploitive academic publishing businesses, also referred to as predatory or write-only publishing businesses who profit from authors fees by fast publishing texts with a poor academic standard, is a debated problem. In the following text, we will discuss a problem of disinterestedness, when the infrastructure for multimodal research has strong commercial interests in fields which are not always coherent with sound research ethics.

Organised scepticism is the last of the Mertonian norms claiming that science has to be critically scrutinised (Merton [1942] 1973, 277). The predominant method for organised scepticism is the system of peer review. A *peer* in this context is an expert in the field with the ability to scrutinise others who are experts in the same field (Kelly, Sadeghieh and Adeli 2014). A peer reviewer is expected to make accountable judgements on the quality of research from an insider's perspective. The peer review process serves mainly two purposes: firstly, to determine whether the research reaches an acceptable standard of quality for publishing; secondly, to help the authors to improve the quality of an accepted manuscript. In this regard, the reviewers' critique is both a verdict and a gift.

There exist biases and indiscretion among reviewers, and the process may be inert and opaque (Weller 2001). The harshest critics state that the system is unscientific and effectively working as a black box (Smith 2006). Despite criticism, the system has no real alternative and is still considered a viable form of scientific evaluation by the scholars themselves (Publishing Research Consortium 2016). Basically, the academic system for assessment of research through peer review is the same as the guild's tradition of assessing craft knowledge and skills.

Concerning new academic fields, with strong connections to a professional field of practice, the antecedent judgement of who is a suitable peer reviewer may hold the real problem. There is a natural scarcity of reviewers with both high academic merits and insider perspective—i.e., peers. When the emerging pieces of research are to be evaluated in such circumstances, there is a risk that traditional disciplinary formats and research strategies are favoured and, furthermore, that the particular significance for the craft subject is foreseen.

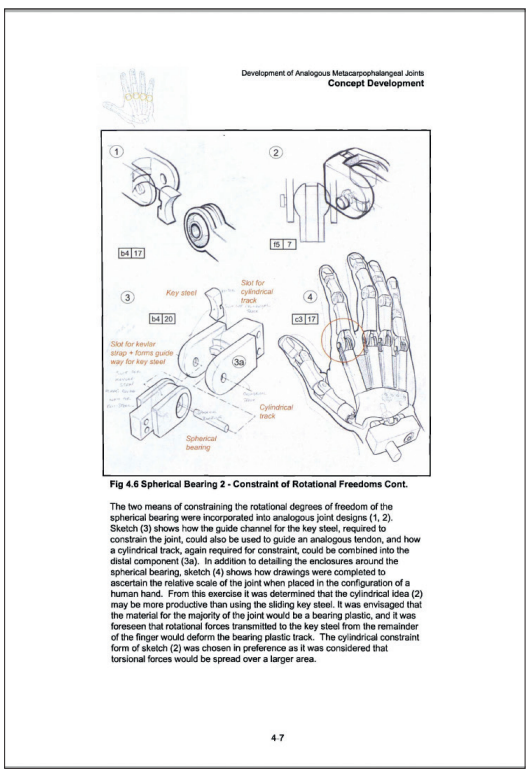
Criteria for Assessment of Craft Research

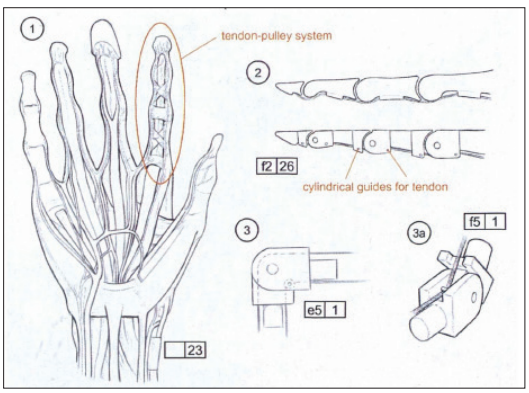
Each research council, faculty, and publishing house has its own criteria for assessment of the quality of research. Ticking all the boxes in assessing craftsmanship in science involves both attending to detailed formal and 'provincial' regulations, and generic epistemological requirements. The researcher has to adopt particular requirements of language and grammar, specific reference systems, and any specified formats for communication. The editor of a journal will make sure the author has followed the journal's guidelines before initiating a review process. A dissertation in one faculty has to be a monograph and in another faculty has to be a compiled thesis. One supervisor tells the doctorate student that science can never be written in the first person, while yet another urges the student to be more personal and self-reflecting.

Baseline requirements in formal peer review procedures are the *original contribution* and the *overall quality of research*. Original means that it has not been done before, it is new; the contribution infers the value to the current field and the peers, and in rare cases to the whole world. *Significance* is sometimes used to encapsulate the originality and contribution of the research, pointing foremost at the results and conclusions. The most difficult question to assess is *the overall quality*. The scrutiny of overall quality is, to a large extent, handed over to the discretionary authority of the reviewers or examiners. A recurring concept is *rigour*, meaning the inner logic and coherence achieved through "the chain of reasoning" (Niedderer 2009). Rigour addresses research as a construct, and depicts how convincingly the academic artefact is made.

The assessment of craft research does not substantially differ from standard research. One characteristic for the kind of craft research in focus in this review is the instrumental use of practice. However, research is distinguished from practice. Stephen Scrivener proposes that research is scholarly "only if it is 1) a systematic investigation, 2) conducted intentionally, 3) to acquire new knowledge, understanding, insights, etc., that is 4) justified and 5) communicated 6) about a subject" (Scrivener 2009, 71). Chris Rust, Judith Mottram, and Mark Elshaw argue that research in creative practices must "prove the ownership" and claim the practice as research by 1) indicating the research problem and its rationale, 2) demonstrating a good understanding of the research context, 3) acquiring research methods and consolidating them in an explicit way that is understood by other researchers, and 4) verifying the results and contribution of their research (Rust, Mottram and Elshaw 2007, 75). Nigel Cross suggests that the best design research is "purposive, inquisitive, informed, methodical, and communicable" (Cross 2007, 126). A particular question of rigour pertains to the craft researcher intervening in practice and thereby affecting the results (Eriksson et al. 2019). The craft researchers use their own craft instrumentally as a method and sometimes also address themselves and their own practice in the research (Almevik, Jarefjäll and Samuelsson 2013). Consequently, a question for assessment is the methodological transparency and proofs of self-accounting and self-analysis in research (Pedgley 2007).

To conclude, well-established norms of what science is, as well as generic features of the system and criteria for assessment of quality of scientific research, do not in any way delimit augmented uses of visual medias and multimodal formats. However, the peer review process requires delimitations and calls on standards and discipline. The format has to enable the reviewer to comprehend and follow how the research is made and with what means. Furthermore, the assessment has to be feasible for the reviewer within some defined time-frame and comparability between different outputs. A full research paper that is submitted to a journal has some kind of restriction in word count, but how long should a filmed research output be? What measure of limitation is relevant for the extent and complexity of an interactive application? The standardisation in scholarly work is made for textual outputs, but what is a relevant system of references in a 3D model? How should Harvard or Oxford references be annotated in a research film?





Figures 1 and 2: Graham Paul Whiteley's investigation "An Articulated Skeletal Analogy of the Human Upper-Limb" is an early example of a doctoral thesis in practice-led design research, presented at Sheffield Hallam University. The research process is iterative, combining the close study and scrutiny of the human anatomy, the physical model making, and the involvement from the end-users at an early stage in the development. Here, an image quotation (Whiteley 2000, 3–13, 4–7) of the "observational drawing" and "sketchbook idea development" are essential parts of the creative research method. The scientific visualisation is consequently presenting the content of the research integrated in the linear argumentation of the thesis. Images by Graham Paul Whiteley.

POSSIBILITIES WITHIN THE SYSTEM

Scientific Imaging

An integral part of doing research in long-standing sciences is to translate the study object into visual material that can then be compared and processed, and also shared and criticised. In early science publications we find artistic ink drawings of the objects of research; the cultural remains, body parts, plants and animals, often incorporated in typologies and taxonomies. In fact, one could argue that no scientific field is matured or even functional without a developed and agreed-upon method for translating aspects of the physical reality into visual media (Smiles and Mooser 2005). For instance, archaeological excavations were not scientific before there were section drawings and vase-profiles. The applied sciences still rely substantially on images to draw conclusions and bring evidence to support an argumentation. In publications detailing scientific conservation and archaeology, we frequently find images produced through new technologies, such as 3D recording, x-ray, and multispectral and reflective transformation imaging that make possible the visualisation of evidence or the augmenting of properties that would not otherwise be observable to the human eye (Payne 2012). These types of images have an undisputed scientific status, while other images are dispensable illustrations. The more theoretical an image is, the higher the scholarly status it gains (Latour 1990; Westin 2012). A drawing of a building's façade, for instance, is illustrating the obvious, while a ground plane or

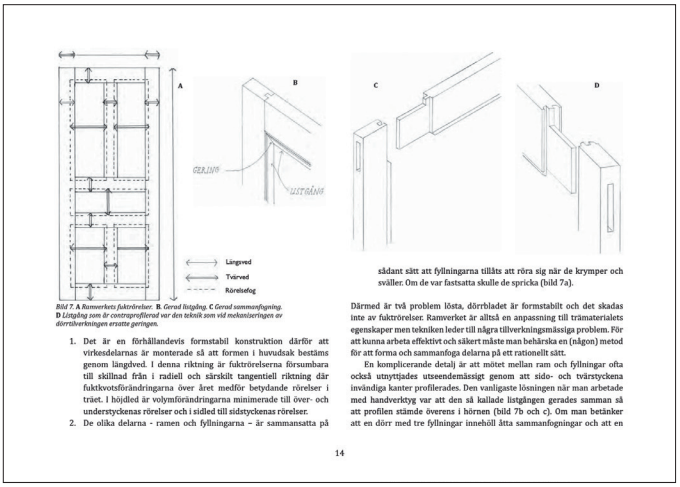


Bild 7. A Ramverkets fuktrörelser. B. Gerad listgång. C Gerad sammanfogning. D Listgång som är contraprofilerad var den teknik som vid mekaniseringen av dörrtillverkningen ersatte geringen.

1. Det är en förhållandevis formstabil konstruktion därför att virkesdelarnas är monterade så att formen i huvudsak bestäms genom längdved. I denna riktning är fuktrörelserna försumbara till skillnad från i radiell och särskilt tangentiell riktning där fuktkvotsförändringarna över året medför betydande rörelser i träet. I höjdled är volymförändringarna minimerade till över- och understyckenas rörelser och i sidled till sidstyckenas rörelser.
2. De olika delarna - ramen och fyllningarna – är sammansatta på sådant sätt att fyllningarna tillåts att röra sig när de krymper och sväller. Om de var fastsatta skulle de spricka (bild 7a).

Därmed är två problem lösta, dörrbladet är formstabilt och det skadas inte av fuktrörelser. Ramverket är alltså en anpassning till trämaterialets egenskaper men tekniken leder till några tillverkningsmässiga problem. För att kunna arbeta effektivt och säkert måste man behärska en (någon) metod för att forma och sammanfoga delarna på ett rationellt sätt.

En komplicerande detalj är att mötet mellan ram och fyllningar ofta också utnyttjades utseendemässigt genom att sido- och tvärstyckena invändiga kanter profilerades. Den vanligaste lösningen när man arbetade med handverktyg var att den så kallade listgången gerades samman så att profilen stämde överens i hörnen (bild 7b och c). Om man betänker att en dörr med tre fyllningar innehöll åtta sammanfogningar och att en

14

Påritning/sammansättningar sidstycken

På dörrbladet finns ytterligare ritsar vars funktion inte är lika uppenbara. Översätter vi denna tolkning av ritsarna till en tillverkningsprocess, den behandlar påritningen och sammansättningen av ramen, kan det ha gått till på följande sätt.

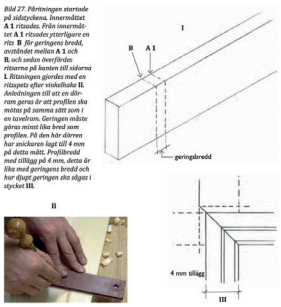


Bild 27. Påritningen startade på sidstyckena. Innermåttet **A 1** *ritsades. Från innermåttet* **A 1** *ritsades ytterligare en ritsa* **B** *för geringens bredd, avståndet mellan* **A 1** *och* **B**, *och sedan överförde ritsarna på kanten till sidorna* **I.** *Ritningen gjordes med en ritspetz efter vinkelhake* **II.** *Anledningen till att en dörram gerас är att profilen ska mötas på samma sätt som i en tuvelram. Geringen måste göras minst lika bred som profilen. På den här dörren har snickaren lagt till 4 mm på detta mått. Profilbredd med tillägg på 4 mm, detta är lika med geringens bredd och hur djupt geringen ska sågas i stycket* **III.**

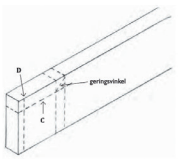


Bild 28. För att markera hur djupt geringen ska sågas ritsades med ett strykritsmått ritsa **C** *och en ritsa för geringsvinkels droga upp. Ritsa* **D** *markerades för tapphålets bredd.*

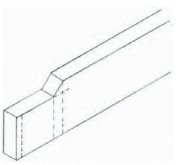


Bild 29. Efter påritningen sågades geringen. Geringen kan också ha skurits efter mall med ett stämjärn.

39

Påritning/sammansättningar sid- och mellanstycke

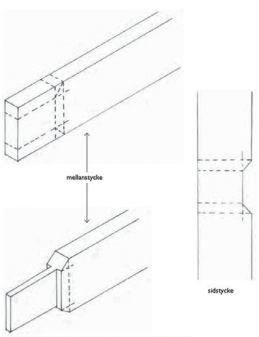
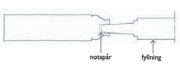


Bild 40. Mellanstyckets påritades och slitsades på samma sätt som ytterstyckena, förutom att stycket gerades på båda sidorna.

Notspår

Bild 41. När sammansättningarna var klara återstod, för att färdigställa ramstyckena, att hyvla ett notspår för fyllningen och att hyvla profilen. Ritning Peter Sjölmar.



Låsning av tappar

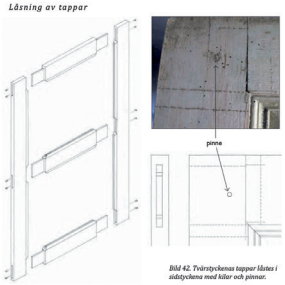


Bild 42. Tvärstyckenas tappar låstes i sidstyckena med kilar och pinnar.

43

Till sist avjämns falsen med rubanken (bild 219 a).

Min uppskattning är att med metoden producerar man en löpmeter fals på 5 minuter. Notspåret fungerade också som ett djupstopp för rubanken eftersom sidan bredvid stålet stoppade mot spåret. Notstålet måste då vara bredare än rubankens sida (bild 219 b). På några ställen hade nothyveln lutats något utåt vid hyvlingen, vilket innebar att spåret inte var i rät vinkel mot falsens innerkant och att spåret på dessa ställen hamnat under ritsen som markerar falsens djup på 12 mm (bild 219 c).

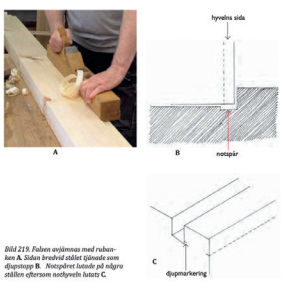


Bild 219. Falsen avjämnas med rubanken **A.** *Sidan bredvid stålet tjänade som djupstopp* **B**. *Notspåret lutade på några ställen eftersom nothyveln lutats* **C**.

Sammansättning

Sinkningen inleds med att karmens innermått på bredden och höjden ritsas på karmstyckena (bild 220).

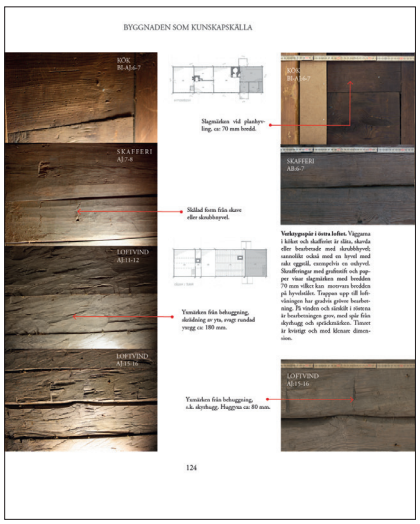
Tappsinkorna ritades på över- och understyckena efter Bongs mått (1906:26) för att jag skulle få se storleken på tapparna och placeringen (bild 221). Traditionellt gjordes sågningen av tapparna på fri hand utan påritning. Det återstående arbetet med sinkningen utfördes på det sätt som den tidigare nämnde snickaren Ove Malm gjorde när han b.la. tillverkade

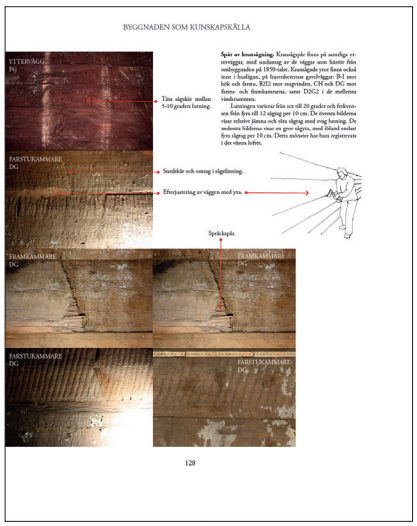
Bild 220. Innermåttet ritsas.

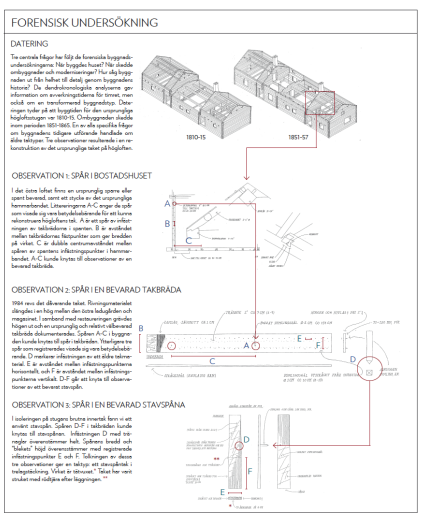
Bild 221. Tapparna utritade efter Bongs måttsättning.

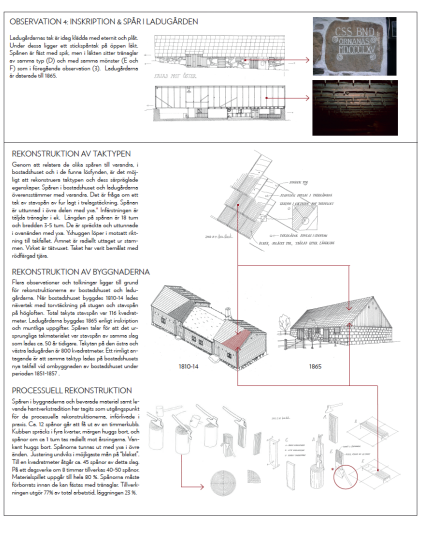
111

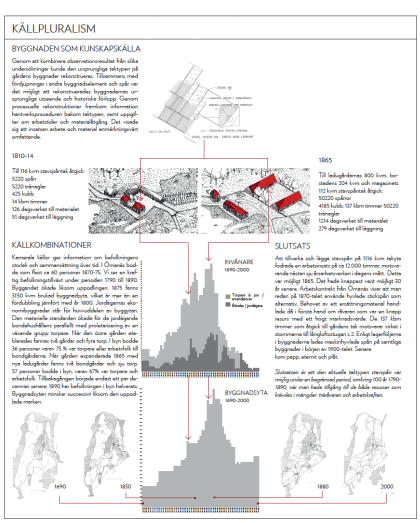
Figures 3–6: A peculiar observation in our review is that the sequential imaging of procedures in the craft making, the visualisation in a 2D step-by-step of how something is done, is rarely seen in craft research publication. On the other hand, there is frequent aesthetic imaging of craftspeople in a setting of action but with a shallow message of content. Our hypothesis is that the sequential imaging is negatively associated with the method's time measurement, and also from the genre of technical instruction and do-it-yourself tutorials. There are, however, exceptions. Above is an image quotation of Tomas Karlsson's thesis on the carpentry of framed doors (Karlsson 2013, 14, 39, 43, and 111). The scientific image is the main language for research communication on content, and the procedural images are used to interpret historical sources, articulate the hypothesis for the research, depict the craft experiments, and also to substantiate results and conclusion. Images by Gunnar Almevik.











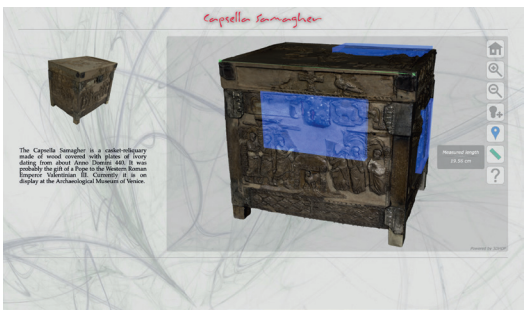
Figures 7–11: Gunnar Almevik employs a 'forensic' perspective in building history studies, where properties and traces in buildings are interrogated and assessed as possible evidence to a narrative on meaning. Like a crime scene investigation, the chronology and reconstruction of events establish the foundation for interpretation. Similar to the process of justice, the goal is not only to disclose what occurred but also why. Presented above is an image quotation (Almevik 2012, 124, 128, and 327–329) of the line of argumentation, evidencing that the transformation of a historic building, considering the extent of craft labour and materials, correlated with the concurrent transformation of demography and landscape, is feasible only in a short period in history. Images by Gunnar Almevik.

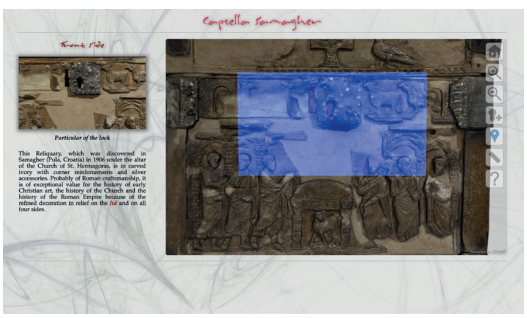
section drawing represents a theoretical view which requires a deeper analysis to produce and also a higher preunderstanding. However, it is rare that any of these images constitute research by themselves as they are primarily visual representations of a tangible reality. This could be contrasted with visual methodologies such as time-geography—an analytical method of mapping out procedures in relation to a spatial context—and space syntax—an analysis of spatial relations, where the production of the image is central to the thought-process and the argumentation. The resulting visual output thus carries much of the analytical processing of the scientific work, and might in some cases be the main outcome of research rather than a stepping stone towards textual argumentation. These examples, however, do not constitute any conflict with traditional research communication, as it is possible to present the images as conventional 2D images. Recently, publishing houses have developed ways of augmenting the text-based research paper with new visual media and data in formats other than text, images, or diagrams. This progress has been made possible by an increased readership online, and online-only journals. Several of the large publishing houses offer authors the opportunity to hyperlink supplementary material to their article that may be uploaded in a wide range of formats and, for large data sets, to external multimedia platforms such as *FigShare*, *DataCite*, or *ScholeXplorer*. The digital interface enables readers to navigate between the published article and associated data sets. However, the supplementary material is not necessarily scrutinised in the peer review process. For instance, the publishing house Taylor & Francis informs the authors that extensive analytical supplemental material should "ideally be subject to peer review."[2]

Interactive 3D Representation

There has been ample research on the technical aspects of new media and how digital technologies can be utilised to communicate research (see Debevec 2005; Pollini, Swartz and Kensek 2005; Kahr-Højland 2007). The continuous development of 3D software, adapted for a broad variety of users and fields of application, provides the potential to amend traditional research outputs. In the context of academic work and publishing, 3D documentation and visualisation have several advantages as they capture and communicate more of the objects through the user's ability to manipulate the rotation, size, and perspectives directly. In other words, 3D models allow for a spatial understanding that other types of documentation cannot provide (Galeazzi 2015). 3D modelling is considered a basic competence in many craft fields today, and accessible software provide tools to not only model forms but also to layer, texture, light, render, annotate, and animate the computed models for a rich variety of outputs. The documentation and scanning technologies are also advancing. Photogrammetric triangulation, where measure points in 3D are calculated with data through digital 2D photography, is an assessable technology with increased impact in both research and practice (Historic England 2017). Another approachable technology is 360° video to provide a point-of-view capture of the human body in action (Thane 2019).

There are some initiatives that may pave the way for including 3D elements in research outputs. Taylor & Francis, for instance, has partnered with Sketchfab to allow researchers to publish 3D models in their online publications, making them the first major publisher to incorporate such models within the web-version of the articles they publish. As the viewer is integrated in the online journal,



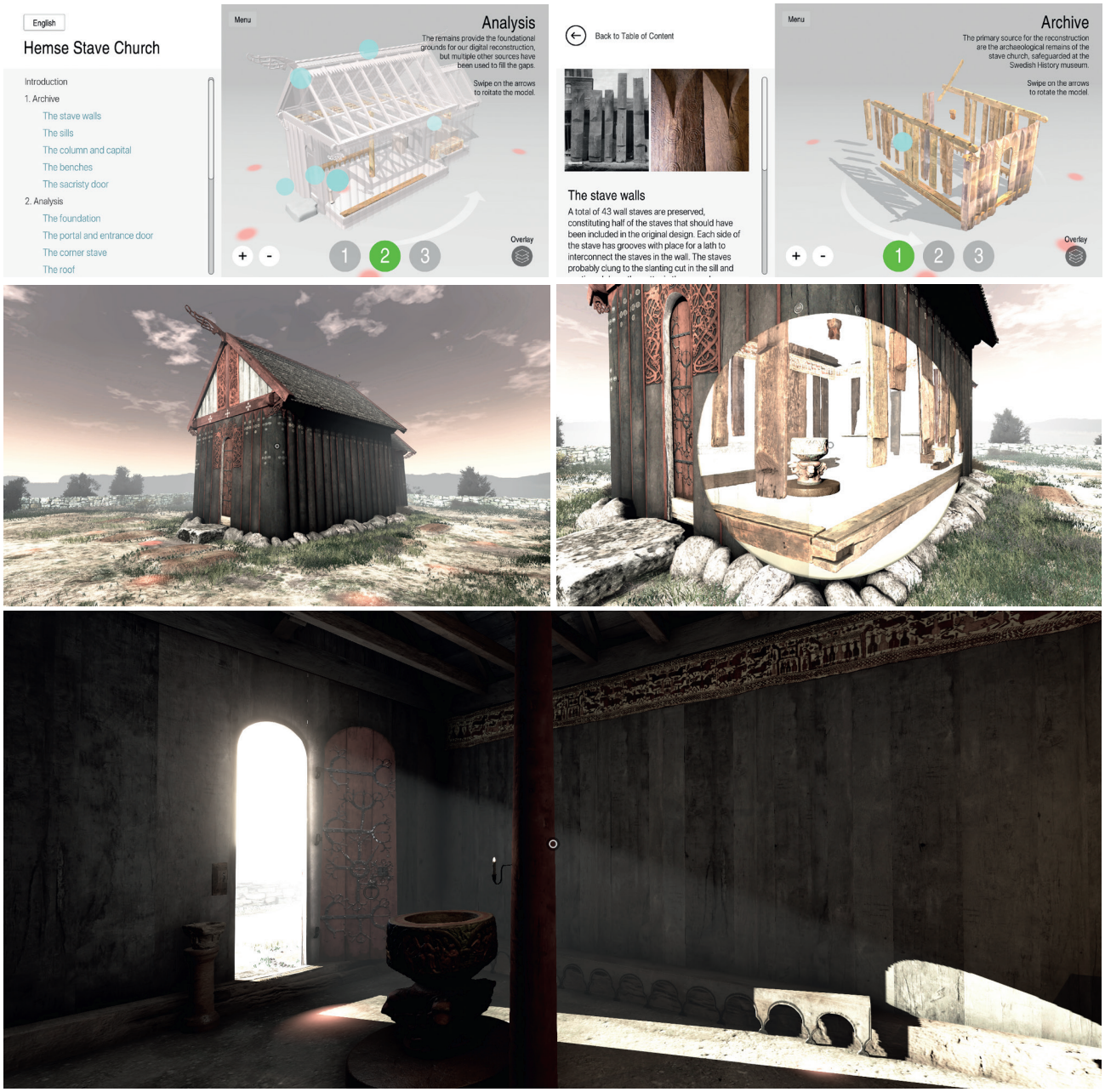


Figures 12–13: Interactive 3D communivation of the National Archaeological Museum of Venice's investigation of a wooden casket reliquary from 400 AD using 3DHOP's resource. The reader may rotate the 3D model, take measurements, and also access annotated information through marked up areas of interest. Images by National Archaeological Museum of Venice.

the reader does not have to navigate away from the research output as an entity. However, Sketchfab is a commercial platform that may compromise the disinterest of scholarly research—but there are few alternatives. Model Viewer, Potree, and 3DHOP are alternative open-source frameworks for interactive web presentations of 3D models (meshes and pointclouds) through JavaScript components. As with Sketchfab, high resolution models can be embedded in online material and thus seamlessly integrated into the research output.

However, despite the recognised possibilities and the rigour that goes into the production of highly scientific 3D models, there are still no widely accepted procedures to publish and assess 3D outputs in their own right. The use of interactive 3D communication demands an epistemological change in how we approach and make use of research outputs. The basis for 3D communication is the interactivity where the user may roam the model or environment. The 3D models being rich in detail but also overloaded with information complicate the evaluation process for the peers and reviewers as it can be hard to discern what to focus on. On a general level, interactive 3D communication as a form of research output needs a notation system to direct the viewer's attention to details, and to guide the inspector of the model in the line of the relevant argumentation. Commercial 3D visualisation platforms such as Sketchfab offer the possibility of tagging hotspots on a model that, with a number series, may guide the user through the visual data. It would be possible to ground the structure of the research output on a model or series of models, and provide references and the meta narrative of research with a conventional IMRAD structure through the tags.

A 3D model may represent a real artefact or environment but all existing technologies mediate, reduce, and to some extent also manipulate the qualities. Taylor & Francis ask the authors to be as transparent as possible, particularly in terms of how the model is optimised or refined by postprocessing tools. The publisher refers to good practices developed in cultural heritage, and particularly the London Charter for computer-based visualisation. The Charter emphasises using computer-based visualisations only when the situation dictates that they will be useful, that research sources should be evaluated in a structured way, and that the individual communicating the visualisations must provide sufficient information about methods and outcomes which can be understood in relation to the context and purpose for which they are deployed.



Figures 14–18: The Biennial International Conference for the Craft Sciences (BICCS) 2021, in collaboration with the Swedish Craft Laboratory and Center for Digital Humanities at the University of Gothenburg and *FormAkademisk* journal, opened for interactive applications as research outputs, along with submissions of multimedia papers, film articles, and traditional research papers or in situ communicated and filmed exhibitions and performances. The interactive article "Crafting Research Communication in Building History" is probably the first interactive file that has ever been produced as a research output which has been scholarly scrutinised in a double-blind peer review process. The interactive article is produced in Unity 3D, different versions of which can be exported and installed depending on the user's operative system. The article concerns an investigation and digital reconstruction of the archaeological remains of a stave church. Above is an image quotation (Westin and Almevik 2021) showing the application's chapter structure, with an introduction presenting the research, a display in 3D of the archaeological sources, an analysis where primary sources and analogies are contextualised as a stave church assemblage, and the result as an immersive interactive reconstruction of the building that the reader may roam. The reader is, in the immersive first-person view in the last chapter of the application, provided with a lens to inspect what are the existing remains and what are interpretations. Images by Jonathan Westin and Gunnar Almevik.

Research Film

Video is a frequent method of data collection in many research practices and not least in craft research (see Groth in this publication). Video capture provides a rich document for analysis through various approaches like skills analysis in anthropology and ethnomethodology (Gowlland 2015; Ivarsson 2017), micro analysis of interaction (Johansson and Illum 2009), gesture analysis and self-study of embodied cognition (Høgseth 2007; Groth 2017) or in spatial studies like time-geography (Jarefjäll 2017). In the final research output the video is, however, most frequently represented by a screenshot image. Video clips may at best be included in the research, provided through a link to an external video platform, appended to the output or eventually embedded in the research output per se. What is the possibility of producing a film as a research output per se? Digital video is easy assessable, possible to enclose and transfer as a document, and also possible to embed in other document types and platforms. The linearity is similar to text and can be used to convey research with a clear line of argumentation and also in the IMRAD structure. The digital format makes it easy for the viewer to go back and forth and also stop at sections with, for instance, text-based information.

The *Journal of Video Experiment* (*JoVE*), the *Journal of Anthropological Films (JAF)* and the *Video Journal of Education and Pedagogy* (*VJEP*) are three journals sharing the conviction that video is a relevant and beneficial media for research communication. *Journal of Video Ethnography* (*JVE*) was another film journal that has now been closed down. *JAF* publishes "original, empirically based contributions that present new insights to the study of human behaviour through audio-visual means". The journal has few instructions, but the film should be based on "longer term fieldwork and methods of research". *JAF* considers films that stand alone as original, empirical contributions, as *JVE* would not consider "decontextualised 'clips' or videos that require text documents to be understood."[3] *VJEP*, on the contrary, emphasise the corroboration of text and video in the output: "Authors should assume that the video component is not intended to be viewed in isolation but is always contextualised within the framework outlined by the written component."[4] *JVE* ask for a mandatory extended abstract with a summary of the content, a statement on the methodology, the main findings conveyed by the film, and a list of scholar references, in all delimited to 2,000 words, while *VJEP*'s articles are full research papers following conventional style guidelines.

JoVE is another journal that seeks to fill a gap in scholarly publishing, applied in physical and life sciences. *JoVE* publishes "video method articles" with the intention of ensuring "a more effective transfer of information and experimental detail than with traditional text-based articles."[5] *JoVE* publishes research in traditional science fields but the journal's focus on the research practice and uses of method is also relevant to craft sciences, where the practice often plays an instrumental role as a research method.

JoVE and *VJEP* provide the server and platform where the research is stored and displayed, while *JVE* imbue the submissions to get a Vimeo account, a commercial video platform, from where the journal embed a link. The three video journals have different approaches in how to guide and standardise the submissions. *JVE* has few restrictions other than technical directives on file formats and size, and issues of copyright and consent. The submitted research film shall not exceed 360 minutes

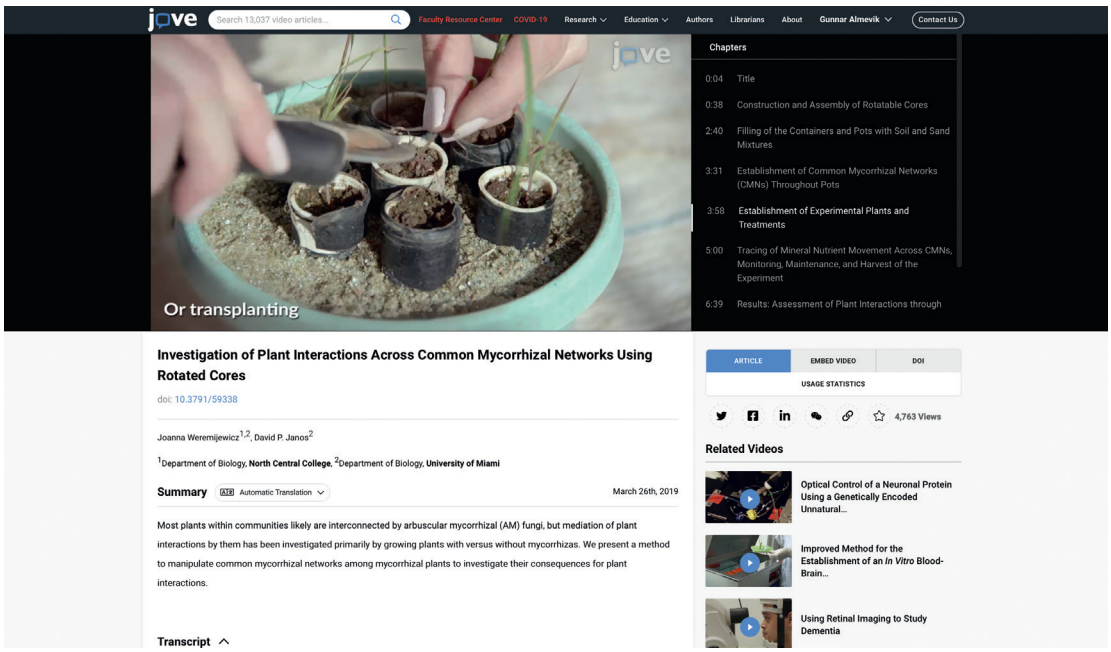


Figure 19: Johanna Weremijewicz and David Janos's video method article on plant interactions in JoVE (Weremijewicz and Janos 2019). The article concerns a method to manipulate mycorrhizal networks to investigate how plants interact, and the video provides an opportunity to demonstrate the practice of the method. The video is divided into chapters and JoVE's online interface presents the video alongside the table of contents with time references instead of page numbers. Below is a short written summary and a window to expand a description of the method. In the digital object identifier (DOI) window, there is text corresponding to the chapters of the film following the discipline of an introduction to the research, a practice-oriented method protocol, an outline of representative results, and discussion. This text can be downloaded in PDF. Images from JoVE and Johanna Weremijewicz and David Janos's article.

and at least 80% of the footage must be recorded by the author(s). *VJEP* also provides basic instructions for the "video component," that can be one or several clips but which altogether must not exceed 15 minutes. There must be an English audio narration and the author should avoid fancy transitions and music soundtracks without copyright. The video component may have different purposes in the article, like an extract of data for illustration, a summary, or commentary, but *VJEP*'s articles, in our opinion, appear much as embedded supplementary material while the text is still the hegemonic media for communication. *JoVE* has a totally different approach, as a team from the journal makes the footage and edits the research film into a standardised format. The researcher writes a text protocol for a "video methods article" that includes the standard title, abstract, keywords, and references, but which is mainly devoted to "a detailed description to enable the accurate replication of the presented method by both experts and researchers new to the field" and furthermore "a concisely written description of representative outcomes following the use of this method."[6] The journal first makes an evaluation on the feasibility of filming and whether the science can properly be visualised through film.

Lack of a standardised structure may be a challenge to both reviewers and peers of the research. Most text-based journals have a similar structure in the line of argumentation, and delimitations measured in words or characters, typically from 3,000 to 10,000 *words* in length. What would be an equal length for a research film? A six-hour long research film in *JVE* without any specific limits on the line of argumentation would require a lot of reviewers and peers. *VJEP*'s emphasis on the written part and the video component operate together. The journal suggests that a 15-minute video could corroborate with a 3,000-word text, but if the video is shorter, the text may be extended to 4,000 words. The common video method article in *JoVE* is between 10 and 15 minutes and is sectioned into chapters, basically in the IMRAD structure. The video is displayed on the journal's web portal with the table of contents, the video timeline, and the text protocol constantly visible, so the viewer can stay oriented and can concurrently assimilate both the written and audio-visual content.

Multimodal Platforms

An early initiative of multimodal publication was *Vectors Journal* that already in 2005 provided peer review and online publication of research in mutable and multiple forms. Until 2013 the journal encouraged "a fusion of old and new media in order to foster ways of knowing and seeing that expand the rigid text-based paradigms of traditional scholarship".[7] Today, most research is published online with the possibility of downloading a document in Portable Document Format (PDF). In the exclusive online publication, various media like 3D models, video, or sound clips may be embedded in the research output. In the field of artistic research we find examples of designated multimodal journals like *Journal of Artistic Research* (*JAR*) which publishes artistic research online in a format like an art exhibition. This online research exhibition combines the standard elements such as title, abstract, keywords, and table of contents but with a spatial representation of an exposition where text, images, video, and sound are artistically allocated (further reading in Schwab 2011; Schwab and Borgdorff 2014). The interface of *JAR* is arranged like a spatial representation of an exhibition which the reader can roam. Any media files that work on other computers are accepted. The delimitation of submissions in *JAR* is not the number of characters or illustrations to a text, but "the exposition must not be too long." The time to access "all essential aspects of the exposition" should not exceed an hour of investigation.[8] The *Nordic Journal for Artistic Research*, inaugurated in 2018, is another journal that uses a digital exposition for publication. Both of these journals, as well as the *Journal of Sonic Studies*, are linked to the *Research Catalogue* from where elements in the database can be connected to a particular research output in the journals.

Online publication opens up the potential for multimodal means of communication. However, the downloadable documents commonly include only text and images. It is, of course, possible to use hyper-links but this forces the reader to leave the actual output, and it doesn't work in physical printing. With printed quick response codes (QR) the reader may access film and 3D models on the web but will need a mobile device to complement the reading. To use text and 2D images is functional in PDF but 3D media is hamstrung by lacking standards. While the Adobe PDF format supports 3D files, this is limited to the Universal 3D format, which is not supported by major modelling software. Furthermore, the interactive elements of these PDFs only

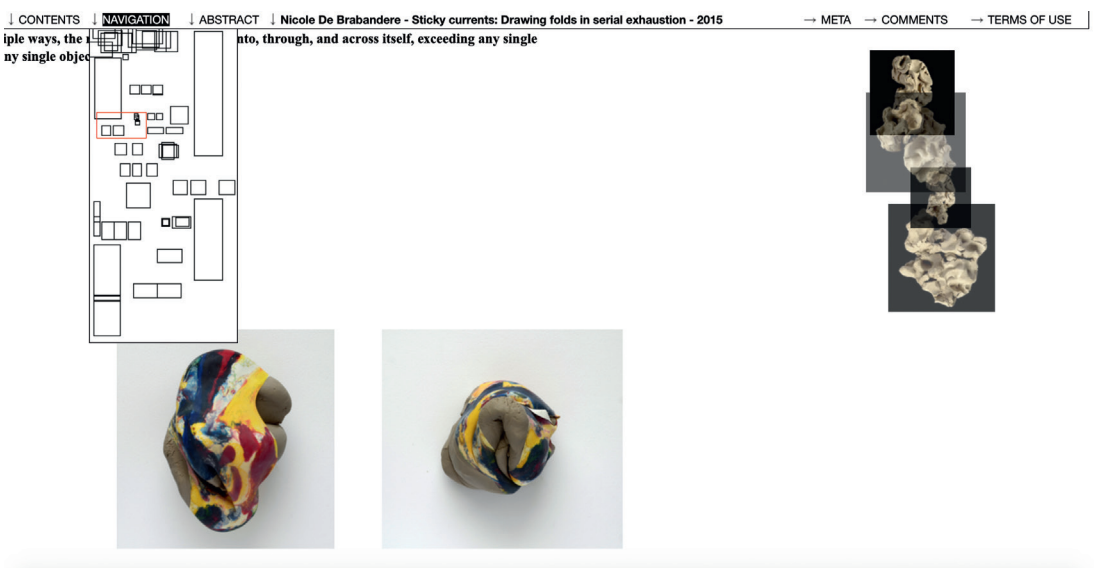


Figure 20: Nicole De Brabandere's research exposition (2015) "Sticky Currents: Drawing Folds in Serial Exhaustion" published in JAR. The exhibition seeks to activate affective qualities of surface and skin in drawing operations and wedging of clay. The interface provides an overview of the exhibition, like a spatial table of content that the reader can access and roam about. De Brabandere's displays evoke the embodied memory of compressing and folding clay and the materials sticking on skin by means of images, video, drawings, and texts. Images from JAR and Nicole De Brabandere research exposition.

function in Adobe's own PDF reader. The file size and compression possibilities are also a hinderance to, for instance, embedded video in the PDF.

An alternative technology that is less explored in research communication is the interactive file. Today there exist several integrated development environments and game engines that are more frequently used in commercial product demonstration and education and training. The training of surgeons and pilots involves, for instance, virtual reality applications as learning resources. Through these game engines, a physics-based interactive application can be published that assembles various digital assets in an interactive space where the corroborating effects of, for instance, movements, light, and sound can be simulated. The space may be displayed in the first person view or as a strategic overview and may also involve virtual multiparticipation. The technology may combine interactivity where the reader/inspector/player roams the constructed space and a hierarchy of scenes or chapters where the narrative is constructed. The application can be exported for desktop use or for head-mounted virtual reality display. Combined with augmented reality software, the researcher may interconnect a digital research output with real places and materials (Liestøl 2011; Westin and Almevik 2017). The problem of a bisected thesis in a written part and an art or craft work could be bridged by this technology. The crafted object and the explanatory digital application could form a single unit as a research output.

RETHINKING THE ACADEMIC ARTEFACT

> "Research is a practice, writing is a practice,
> doing science is a practice."
> Christopher Frayling (1993, 4)

The craft sciences is a domain of subjects struggling with the academisation and transfers of people and discourses in their path from a field of practice to a field of inquiry. This domain of subjects needs a common strategy to maintain the inside perspectives throughout research communication. There has been extensive research and debate concerning the nature and quality of assessment of artistic and practice-led research (to which the craft subjects have been associated). The perspectives divide at, on the one hand, a "sui generis perspective," and on the other, a path of both crafting and adjusting to the norms of traditional sciences. We adhere to the latter perspective. The argumentation follows Anne Solberg, to seek a position inside academia and learn from traditional sciences when it proves to be suitable. On the other hand, if the craft sciences disconnect from their corresponding fields of practice, they will become obsolete and irrelevant. We argue that a core challenge to integrate the practice of craft in the scholarship of crafts is to find a relevant and rigorous way of assessment and communication of research.

The review presented in this chapter shows that the norms associated with science as a distinguished type of knowledge and the academic peer review system for the assessment of research are on a principal level neutral to the formats of how the research is communicated. However, the text has a hegemonic position by tradition and has been codified in a set of accepted genres where the full research article is the most common research output. The standard of the format is not unessential; the peer review system needs transparent, comparable, and thus disciplined outputs and also with delimitations which make the assessment feasible within a time frame. There are initiatives by publishing houses, universities, and faculties to provide alternative formats for multimodal research communication, but they generally lack standardisation and disciplined ways of dealing with length, references, research design, and line of argumentation. The conclusion points towards the need for complementary genres for research communication, adapted to multimodal media but in disciplined formats. There is also a need to support the complementary and subordinated position of text-based research communications like in extended abstracts, extended captions, and system of notations of 3D models and films.

We can point towards the film and the interactive application as being two useful media technologies for the communication of craft research. Both these technologies are multimodal as they can integrate video, sound, image, and text. The technologies can produce replicable copies of a narration or argumentation with an IMRAD structure and procedures for how to reference and communicate other works, making possible the referencing by others. It is also possible to standardise the format through minutes of a timeline, number of scenes, or level of depth. Furthermore, in an interactive application, using the game engine's software, the source material for an analysis can be included, whether it be the recording of an interview, 3D-scanned materiality, test results, or the entirety of a corpus, thus answering an age-long critique of the 'opaqueness' of the traditional academic outputs that has made it difficult to question, test, or reproduce published results. Through digital augmented reality layers, craft research communication may

expand by interconnecting the real crafted objects and the meta perspective narrative of research. We have also pointed at the opportunity to benchmark existing formats like the 'video method article' and the 'filmed research article' with corroborating written and video components.

The concept *academic artefact* that appears in the title of this chapter has not been properly introduced or explained. The concept relates to our conclusion and discussion. We propose the concept to destabilise the conventional understanding of research communication. We are reluctant to accept a simple dichotomic division of traditional and non-traditional research outputs which clearly subordinates the diverging exceptions from mainstream outputs. The concept of NTRO blurs what is a research output that undergoes peer review and what is a physical result from a research process, what informs the research in terms of data or sources or what are documented elements of the research process. An artefact is manmade, with negotiable meanings and virtues. It is an ambiguous concept, as the term *artefact* in the field of natural science also refers to a mistake. We are aware of the possible misunderstanding in that the term *artefact* in the academic context usually refers to significant pieces like architecture, designed objects, paintings, or even intangible elements like music composition and performances. The artefactual is commonly juxtaposed with written or visual expressions. Possibly, the ambiguity of the concept may open up a discussion. Our interest concerns the functionality of the form for disciplined research communication and the discourse in which it is a product. The academic artefacts are important elements in the construction of academic meritocracy and are thus also vital for new fields to gain position and legitimacy. A scholarly discussion on this key topic is needed in the craft sciences.

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