Multi-, Cross-, Inter-, Transdisciplinarity – Fact or Fiction? Does Archaeology Need a Hand Blender?

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Abstract

The concepts multidisciplinarity, interdisciplinarity (crossdisciplinarity), and transdisciplinarity are defined, and examples are given. Whether interdisciplinarity is a novel development, a "new buzzword", or a "new *status quo*" is discussed. The examples contrast ideals versus realities, and also show what obstacles interdisciplinary research may meet, particularly regarding publication. Interdisciplinarity is described as a continuum with minimum and maximum ends. Examples of archaeological research, from both ends of this continuum, are offered. It is claimed that, in other sciences (specifically, medicine and psychology), "interdisciplinarity" is neither a buzzword nor a new concept and research strategy. It is, rather, "business as usual", and "*status quo*", and actually, is the case also in much archaeological research. The backdrop for the conflicts regarding interdisciplinary research is described as deriving from conflicts within philosophy of science. Yet, new positive and promising theoretical developments exist, along with new corresponding methodological developments. The conclusion is that various fields, theoretical positions, and methodologies need not compete, but may complement each other in problem-focused research.

Keywords

Interdisciplinarity, transdisciplinarity, theory of science, methodology, complementarity, problem-focused research

Zusammenfassung

Die Konzepte Multidisziplinarität, Interdisziplinarität (Cross-Disziplinarität) und Transdisziplinarität werden definiert und an Beispielen erläutert. Hierbei wird diskutiert, inwieweit Interdisziplinarität eine neuartige Entwicklung, ein „neues Schlagwort" oder ein „neuer Status quo" ist. Beispielhaft sollen idealtypische Vorstellungen mit tatsächlichen Anwendungen verglichen und damit aufgezeigt werden, auf welche Hindernisse interdisziplinäre Forschung stoßen kann, vor allem bei der Veröffentlichung. Interdisziplinarität wird als Kontinuum mit unterschiedlichen graduellen Ausprägungen beschrieben. Beispiele aus der archäologischen Forschung sollen die Extreme dieses Kontinuums illustrieren. Es wird argumentiert, dass in anderen Wissenschaften (insbesondere der Medizin und Psychologie) Interdisziplinarität weder ein Modewort noch ein neues Konzept oder eine neue Forschungsstrategie ist. Interdisziplinarität stellt eher *Business as usual* und den *Status quo* dar; und dies gilt tatsächlich auch in vielen Fällen für die archäologische Forschung. Konflikte, die in der interdisziplinären Forschung aufkommen, resultieren aus konfligierenden wissenschaftstheoretischen Positionen. Es werden neue positive und vielversprechende theoretische Entwicklungen sowie neue entsprechende methodologische Entwicklungen skizziert. Schlussendlich müssen verschiedene Forschungsbereiche, theoretische Positionen und Methoden nicht miteinander konkurrieren, sondern können sich gegenseitig in einer problemorienterten Forschung ergänzen.

Schlagwörter

Interdisziplinarität, Transdisziplinarität, Wissenschaftstheorie, Methodologie, Komplementarität, problemorientierte Forschung

New Buzzwords

In their EAA session in 2020, Artur Ribeiro and Alexandra Ion asked an important question in their presentation titled: "Archaeology and Interdisciplinarity: The New Status Quo or the New Buzzword?" In this paper, my aim is to explore, explain, and hopefully answer this question. The direction of the paper is as follows: I will take you on a "guided tour" starting with defining multi-, inter-, cross-, and trans-disciplinarity; give examples of different kinds of interdisciplinary research; describe it as a continuum; point to difficulties in mixing disciplines; give the background for this situation from the perspective of theory of science; and after this explorative and descriptive "tour", finally, I will suggest methodological solutions, and conclude that: Research should be problem-focused and thus demands interdisciplinarity, – and: yes, archaeology does need some kind of "mix *master*" – a tough hand-blender!

Among the EAA 2020 presentations a substantial number used one of these terms: multidisciplinary, inter-disciplinary (crossdisciplinary), and transdisciplinary. These terms, I think, do qualify to be called "new buzzwords". They are frequently used in lofty speeches, such as at the opening of conferences and congresses. You find these buzzwords in research applications and university programs. Like magic formulae they help to elicit research permissions, project approvals, and financial resources.

Yet, it is often unclear what precisely is meant by them. These buzzwords are vague, a bit void of precise meaning. The terms are often used interchangeably, but they do mean slightly different things. *Multidisciplinarity draws on knowledge from different disciplines but stays within their boundaries*. A typical example is an edited book on a particular phenomenon, site, or finding, with chapters written by experts in different fields. An instance of this is a book about the largest highland plateau in Northern Europe, Hardangervidda, located in Norway. The book, *Hardangervidda* (Nyquist 1979), gives detailed and comprehensive descriptions and explanations about Hardangervidda's geology, archaeology, history, botany, zoology, cultural history, climate, etc. Yet, this information is presented in separate chapters, written by experts in the respective fields, with only moderately overlapping themes.

In contrast, *interdisciplinarity endeavours to analyse, synthesize and harmonize links between disciplines into a coordinated and coherent whole, with the various fields giving complimentary insights*. Usually, two or three fields are combined in a single paper or chapter. An instance of this is a paper about a Palaeolithic bird figurine from the Lingjing site in China, where archaeology collaborated with geology and chemistry in order to find out how the figurine was made and *how old* it was (Li et al. 2020). Yet, the analysis stopped there. No experts on symbols and religion were drawn in to explain the symbolic significance of birds, which could have contributed to explain *why* somebody had made a figurine of a bird. The analysis focused on *how* and ignored *why*. If history of religion had been added to the interdisciplinary collaboration, then also the why-question could have been addressed. Unfortunately, in much interdisciplinary archaeological research, there seems to be an "unwritten rule" regarding what disciplines are "permitted" to be combined. This may be due to what combinations are accepted to be presented and published in the, often rather field-specific, journals.

Going a step further, *transdisciplinarity is complementary, and even aspires to go beyond inter-disciplinarity. It crosses and combines many, often quite unrelated, disciplinary boundaries to create a holistic approach*. It focuses on problems that require crossing the boundaries between disciplines. An example is when the disciplines of psychology, acoustics, geology, and religion were combined and integrated to suggest an explanation for the use of sound, and in particular the use of sound phenomena within caves as a psychologically effectful element in initiatory religious ceremonies (Lindstrøm and Zubrow 2014). This merging, mingling, and mixing of fields is close to what Tim Ingold calls going from "complementarity to obviation". Ingold holds the position that we should strive for a collapsing of artificial boundaries between disciplines that should have never existed in the first place (Ingold 2001).

The New Status Quo? Ideals Versus Reality

A hand blender is an electric tool used in the kitchen to cut, mash and blend. If you put in different ingredients, and let them be mixed, cut, and blended long enough, you will not be able to identify the original ingredients

afterwards. They are completely blended into a uniform mass. Now, the question arises: how much do we want various disciplines to be mixed and blended? What are, or how are, the minimum and maximum ends of the continuum, or spectrum, of interdisciplinarity? In the following I will mostly use the term "interdisciplinarity" (also covering transdisciplinarity) since interdisciplinarity is the term used in Ribeiro and Ion's title in their introductory. Is it easy or difficult to work interdisciplinarily? What obstacles may we encounter? I will give three examples of difficulties in interdisciplinary research – illustrating ideals versus reality, facts versus fiction.

I am a researcher at SapienCE, Centre for Early Sapiens Behaviour, CoE, at the Faculty of Humanities at the University of Bergen in Norway. We are a team consisting of archaeologists, psychologists, anthropologists, geologists, zoologists, botanists, oceanographers, climate experts, psycho-neurologists, and more. Our area of research is on the tip of South Africa, close to the sea, with the locations of Blombos Cave, Klipdrift Shelter, Klasies River, and Pinnacle Point Cave; and we primarily deal with the timespan of 100,000–65,000 years BP. The findings are quite astonishing. Some of the most impressive findings are: shell-beads, beautiful bifacial points, engraved ochre, engraved ostrich eggshells, and even a kind of simple hashtag-like drawing in ochre on a stone, and an ochre grinding and processing toolkit (d'Errico et al. 2005; Henshilwood 2007, 2014; Henshilwood et al. 2009). In particular, the engraved ochre and the drawing have received considerable international attention. They are interpreted as, and presented to the media as, proof of very early human higher cognitive functions.

It is obvious that these artefacts cannot be interpreted by archaeologists alone. In order to know what a "cognitive function" or a "higher cognitive function" is, and what brain regions are involved, psychologists, neurologists, and neuropsychologists are needed. In order to explain the bifacial points, which are quite overworked for the function of spearheads for hunting or fighting, explain the perforated shell-beads that must have been threaded on strings, and explain the use of ochre, anthropologists and psychologists are needed. They can suggest reasons why these artefacts exist, basing their suggestions on analogies from other cultures and on typical human behaviours. There-fore, a neuropsychologist, a psychologist, and an anthropologist are part of the SapienCE team.

SapienCE is also dependent on climate experts, geologists, zoologists, botanists, and oceanographers to be able to establish the variations in sea level, climate, wildlife, plant resources, and precipitation during those ca 40,000 years. Their research is necessary in order to fully understand the contexts for the lives of those people who lived there on the tip of South Africa 100,000–65,000 years ago. So, in this project interdisciplinarity is a must. Yet, we struggle a bit with combining information across the fields, as each field is complex and intricate. A greater problem is that journals are mainly interested in publishing articles that are strictly field-specific. That is a challenge! There are not many truly interdisciplinary journals, and those that intend to be, have difficulties find-ing reviewers that can evaluate interdisciplinary manuscripts. It is my impression that many of our publications until now are kept safely within each of the disciplines' boundaries, a "*status quo*". Yet, in SapienCE we actively collaborate by sharing data and having weekly seminars in order to overcome the obstacles. Hopefully, our ideals will not clash with reality. We are still toiling with this.

An example where interdisciplinary ideals completely clashed with reality was the destiny of a thesis, submitted to another institution, (the names of the institution and the author are kept confidential). The thesis' theme was from classical antiquity, and included history, social history, art, religion, gender issues, neurology, and psychology among its integrated disciplines. It had the word "interdisciplinary" in the title. However, the committee that evaluated it consisted of classical archaeologists only. They turned the thesis down. In their opinion, too many disciplines were involved, and purely classical themes were too little represented. One could say they demanded a conservative "business as usual" and a very strict old style disciplinary "*status quo*". The thesis was rejected. It has not been re-submitted.

A third example of disciplinary narrowness is a manuscript that was submitted to an archaeological journal (name of journal and author is kept confidential). A particular group of Bronze Age paintings, were analysed with methods from psychology and kinetics, and the findings were discussed in relation to that particular Bronze Age society. The reviewers concluded that they found this combination of disciplines very interesting and promising, but still too unorthodox and unusual for the journal, so the manuscript was rejected. Another case of conservative "*status quo*".

What Are the Minimum and Maximum on the Continuum of Interdisciplinarity?

The three examples above indicate situations of conservative and non-innovative *status quo*, and not even "a *new status quo*". Only certain disciplines are accepted to collaborate, "those that we are used to", seems to be the rule. New radical interdisciplinary endeavours clash with old conservative obstacles. But fortunately, radical interdisciplinarity is not always countered and met with doubt, resistance, or outright rejection within archaeology. It is sometimes accepted and promoted. And, for comparison, in other fields, despite varying levels of opposition, interdisciplinarity has already been "mainstream" and "business as usual" for many years.

There is an important aspect to interdisciplinarity to consider: One can define it as a continuum with minimum and maximum ends (although not finite endpoints). At the minimum end, the disciplines are already related and connected; at the maximum end, the disciplines have been unrelated and unconnected, but are now used in combination to solve problems that require their combination. I will give some examples.

In a paper within classical studies, the combination of these fields: classical archaeology, classical history, and classical philology, is called "interdisciplinary research" (Østergaard and Schwartz, in press). They state that this is a controversial combination, and that this interdisciplinary combination of fields may have difficulties regarding concepts, taxonomy, and epistemology. However, to me, the combination and interdependency of these fields is rather obvious, and not particularly new or revolutionary. This kind of interdisciplinarity is close to the *minimum* end of the interdisciplinarity continuum because the cooperating disciplines are very close to each other conceptually and epistemologically. Perhaps it qualifies as a "new *status quo*".

In contrast, close to the maximum end of the interdisciplinarity continuum are the following five examples: As early as in 2001, an article was successfully published in which archaeology, history, history of religion, perception psychology, and cognitive psychology were used in combination to analyse how Migration Period animal art, particularly on large gilded brooches, may have been perceived and interpreted by people, and strategically used by the power-elite (Lindstrøm and Kristoffersen 2001). In a similar vein, psychology of perception and neuropsychology were used in an article analysing the concept of *poikilia* as one of several forms of aesthetics in the Greek archaic and classical mind and culture. It shows that *poikilia* was not only a form of philosophical aesthetics, but also referred to psychological states, mythical themes, and even had social consequences (Grand-Clément, in press). A third example: By combining archaeological findings with climate studies, human migration in the Late Pleistocene is found to have been climate dependent (Timmermann and Friedrich 2016). A fourth example is a paper on the digestive and nutritional benefits of cooking tubers (a thickened underground part of a stem or rhizome, a root) – a practice which started in the Palaeolithic. Botany, archaeology, physics, chemistry, and nutrition science were used in the analyses to find out when and why human beings started to and continued to cook their food. This is a habit not shared with other animals. The cooked proteins are easier to digest and must have contributed substantially to the development of the human brain (Wadley et al. 2020). Finally, the fifth example shows that classical archaeology, often regarded as the most conservative field within archaeology, can be enriched by contributions from other fields; yet it may be significant and typical that the report was not published in an archaeological journal, but in a medical journal: An investigation on human faeces from Pompeii which showed that intestinal parasites, as well as other parasites, were a major health problem. It was connected with the popularity of the Roman baths, and with the cosmopolitical contacts between people living in the large Roman empire. This investigation required the interdisciplinary combining of parasitology, medicine, palaeo-parasitology, palaeopathology, zoology, ancient texts, classical history, and classical archaeology (Tanga et al. 2022). In all these five examples scientific fields that are seldom seen together are combined, and these works are close to the *maximum* end of the interdisciplinary continuum. Interestingly, there were no signs of problems regarding theories of science, ontology or epistemology. The collaboration and combination were simply *problem-focused*. In these works, "interdisciplinarity" is a solid and successful reality, irrespective of "fashion", and is certainly not just a buzzword!

Fields other than archaeology already have rather long traditions of interdisciplinary research, both on the minimum and the maximum ends. Medicine, pathophysiology, haematology, and neurology can be combined and called "interdisciplinary research". Yet, as they are all within the discipline of medicine, the combination is on the minimum end of the continuum. In contrast, on medicine's maximum interdisciplinary end, we can find physicians, psychologists, and anthropologists collaborating against HIV. Psychology, like medicine, is inter-

disciplinary by tradition; collaboration with psychiatry and pedagogy is on the minimum end, whereas psychology's combinations with various medical fields (in particular neurology and endocrinology), nursing, and anthropology are collaborations that are on the maximum end of the interdisciplinary continuum. In both medicine and psychology "interdisciplinarity" is neither a buzzword nor a new concept and research strategy. It is rather "business as usual", and "*status quo*". The research is *problem-focused*, in the sense that research methods and theories are not constrained to those that are characteristic and traditional of one field or science, but open to include whatever is required to solve the problem in question.

Buzzwords Meet Philosophy and Theory of Science

The difference between multidisciplinarity and the buzzwords (inter-, cross-, and transdisciplinarity), and the difficulties encountered in realizing interdisciplinarity in research, often relate to the theoretical and conceptual controversies of processualism versus post-processualism in archaeology, paralleling positivism and empiricism versus cultural constructivism and cultural relativism in psychology, in humanistic sciences, and in the social sciences. Processualism and positivism tend to prefer only "hard science"-interdisciplinarity, whereas post-processualism and cultural constructivism favours "soft-science"-interdisciplinarity. This situation is sometimes explained as an incompatibility between the humanities and the natural sciences regarding ontology, epistemology, and methodology – and the contrasts and conflicts between "hard" versus "soft" sciences in general.

Science[1] deals with phenomena that are profoundly divergent and extremely multifaceted. Science regarding humans and human phenomena can be said to have different positions on a continuum ranging from natural laws on one end to cultural relativism on the other. All points on the continuum are intricately interrelated. There is hardly a single human phenomenon that does not have both "natural" and "cultural" aspects.[2] For instance, research on and theories about caries in odontology, includes the physical structure and form of human teeth on the natural, human universal side, and dietary customs and symbolic functions of food on the cultural social constructivist side. Similarly, research on understanding the design and development of Roman amphitheatres, is based on universal natural laws about weight and physical properties of stones relevant for architectural constructions, and the Roman customs of amusement and ideas of religious sacrifice and punishment on the socio-cultural constructivist side. Both natural and cultural perspectives are relevant and necessary for research on dental health and Roman amphitheatres respectively, as both perspectives provide legitimate and relevant data. As Winnie-the-Pooh would say: "*Utrumque*!" ("I'll have both").[3]

"Utrumque!"

The combination of knowledge, perspectives, theories and methodologies from different fields, is irresistibly fascinating. My position is that of Winnie-the-Pooh: "*Utrumque*!" Science should not be restricted by theoretical, methodological, or ideological boundaries. Still, many post-processualists and social constructivists would claim that the two paradigms, processualism and post-processualism (in archaeology), positivism and social constructivism (in the social sciences, humaniora, and psychology) respectively, are conceptually and logically incompatible due to differences in epistemological perspectives, and therefore, a mixing of disciplines is like trying to mix oil and water – ingredients that will not blend, despite a good hand blender.

Yet, there has been a move towards a theoretical union of the divergent positions within archaeology as well. Cognitive-processual archaeology and cognitive archaeology can be suggested as examples for the combination of the two

1 I use the term "science" as synonym for *Wissenschaft* (German) and *vitenskap/vetenskap/videnskab* (Norwegian, Swedish, Danish), as a generic term for all scientific endeavours, encompassing the natural, the humanities, and the social sciences.

2 Despite the outdatedness of the nature versus culture discussion, both lay and learned still tend to use the distinction "nature" versus "culture". Therefore, these terms, and the division they represent, will be used to some extent.

3 "'Utrumque' diceret…." ("'Both' he said…."). Winnie-the-Pooh answered this when he was asked whether he wanted honey or milk with his bread. From the Latin version "Winnie Ille Pu" from the book Winnie-the-Pooh (Milne 1960: 18).

approaches in archaeological studies of the human mind (Renfrew et al. 1993; Fagan 1997). The term "the Synergy Approach", indicating a synergy between processual and post-processual approaches, is suggested by Christine S. VanPool and Todd L. VanPool (1999: 48). They claim that both approaches can contribute to scientific developments in archaeology through "a synergy in which the two programs working together can create a rich and robust understanding of the archaeological record by prompting archaeologists to ask a broader range of questions and to employ a greater number of analytic strategies" (VanPool and VanPool 1999: 48). In the same year, the Middle-Ground Position where archaeological fieldwork was positioned as including both subjective and objective components was suggested by Ian Hodder (1999: 52), who earlier had promoted pure post-processualism. Along this line, but different from post-processualism, one may perhaps include Symmetrical Archaeology (Olsen 2010; Olsen et al. 2003; Witmore 2007a, 2007b), and Materiality Studies (Hodder 2011; Malafouris 2013; Knappett 2014). Emerging from somewhat different lines of thought, unifying positions have been proposed within biology and anthropology as well, with the most radical probably being the Developmental Systems Theory in biology (Oyama et al. 2003) and the interdisciplinary Biosocial Obviation Approach of Ingold (2001: 255–279).

These integrative positions resemble the perspectives in archaeology proposed by Alison Wylie (1994, 2000) and by Robert W. Preucel and Alexander A. Bauer (2001: 93). Wylie (1994) points out that archaeological interpretation may benefit from using multiple independent kinds of evidence and independent analytic techniques. This is a pragmatic, eclectic, multi-methodical attitude resembling the Mixed-Method paradigm in medicine, psychology, and social sciences (Teddlie and Tashakkori 2003a, 2003b). Wylie proposed an even more comprehensive meta-perspective by referring to Ian Hacking (1996) and his claim that all research may have unity on a metaphysical level and, regarding ontology, have a practical unity regarding aims and methods of science, and finally, on a logical level, have a unity regarding principles of scientific reasoning, but not necessarily have unity on a theoretical level. Similarly, Preucel and Bauer have advocated a scientific "unity at the level of logical reasoning (meta-pragmatic level) and disunity at the level of interpretative theory" (2001: 93).

All these approaches and positions have in common that they transcend theoretical, ontological, and epistemological boundaries. One could claim that such a multi-methodical, multi-theoretical position which can be described as pragmatic, eclectic, and "bricolage" has, in various ways, already long been proposed and employed in archaeology (Clarke 1979; Bintliff 2006: xix, 2011: 18–21; Bintliff and Pearce 2011a, 2011b; Pluciennik 2011: 33, 44). Pressing practical problems on excavation sites, or having to interpret unexpected findings, have always demanded pragmatic practical solutions and intellectual inventive flexibility. It has also been argued that this pragmatic "bricolage" eclecticism is *the* new theoretical paradigm in archaeology (Pearce 2011: 84–87).[4] Instead of being paradigmatically monolithic, it is multiverse (Tosi and Pearce 1997) by employing multiple methods and models fitting the investigated *problem* more than defending a particular theoretical *position* (Pearce 2011: 85).

Compete or Complete?

"Paradigm shifts", or at least *conflicts* regarding the philosophy of science, have been, and still prevail, in archaeology. Structuralism versus post-structuralism is an old conflict, but still vibrant. The Third Scientific Revolution, with its natural scientific technologies and methods, is often presented as both a new contribution and a challenge to archaeology. But the combination of natural science and archaeology is already "mainstream" and "*status quo*" in archaeology, as Ribeiro points out (Ribeiro 2022, this volume).

A central discussion, originating in post-modernism's influences on philosophy of science, has been connected to the question of whether science can ever be reasonably *objective*; and following this, to what degree, with what consequences, and in what respect science is *subjective*. This discussion concerns both theory and data, as they are closely interconnected. The traditional view, that data create theories (induction), or that theories guide data collecting (deduction), has been challenged by the idea that data collecting is often "invisibly" guided by undefined or subconscious theoretical or personal viewpoints, an idea that was first proposed within the concept of

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4   By "bricolage" *sensu* Lévi-Strauss (1966: 16–22), Pearce (2011: 85) means that one puts together various elements from relevant theories and methodologies in order to fit the problem or phenomenon being investigated.

the "sociology of knowledge" (Durkheim 1954 [1912]). Such viewpoints include values that are embedded within the scientific process without being explicitly formulated or questioned, or unconsciously embedded in the mind of the scientist.

Another ardent discussion centres on research methodology, the advantages and disadvantages of quantitative versus qualitative research. This discussion is particularly focused on whether it is relevant to employ numerical, *quantitative data* and statistical analyses for human mental phenomena that are soft and intangible; and whether *qualitative data* can have reliability and validity and thus can be generalized (have external validity).

Another conflict centres on questions concerning the existence of human universals: whether certain psychological characteristics, behavioural tendencies and social patterns are typical for humans as a species. This question is relevant for the discussion of whether it is possible to make comparisons and analogies between, or generalize findings from, one socio-cultural-historical context to another.[5]

Today, not only the question of whether human beings are primarily to be understood by their nature *or* their culture,[6] but also their "nature and culture", the adding of culture on a natural substratum, are regarded as outdated (at least in medicine, genetics/epigenetics and psychology). The position now is that nature and culture interact and co-evolve in subtle, intricate, and almost indivisible and indistinguishable ways (Midgley 1995; Bandura 1977, 2005, 2006; Buss 2001; Ingold 2001; Berry et al. 2002). Therefore, the behaviour of individuals and groups must always be understood as "action-in-a-context", as individuals, groups and their contexts are to a considerable extent inseparable (Craig 2003).

Furthermore, Ludwig Wittgenstein's ideals of "complementary discourses" (Wittgenstein 2009 [1953]) and of using the right and relevant tools for each particular problem are increasingly winning ground. This attitude is essential in all problem-focused research. Without losing the methodological rigour of processualism, ideas from post-processualism have gained general scientific recognition, and become mainstream (VanPool and VanPool 1999). They have influenced modern archaeology by broadening and refining its range of observation, sharpening the awareness of subjectivity in the process of interpretation, and by making a focus on "context" a *sine qua non* both within archaeological studies, and in the practices and uses of archaeology. There is now a refreshing recognition of qualitative aspects in even the most hard-core positivist quantitative research circles, and an awareness of subjectivity and contextual biases in all kinds of research, quantitative as well as qualitative. Skirmishes still occur, but now seldom regarding the legitimacy of the different positions *as* scientific positions and methodological standpoints, but rather concerning the *relevance* and the potential *ethical consequences* of the different theoretical positions and methodologies for the particular topic being studied.

Hopefully, interdisciplinarity will, from being a buzzword, become realized, and continue to emerge and develop within all branches and fields of archaeology. It is now increasingly recognized that integrative perspectives really enhance research by providing different points of view, different kinds of and levels of information, different methods, different sets of data, and different ways of integrating and interpreting this information, both analytically and theoretically. More varied and different perspectives are increasingly acknowledged as relevant for different research topics and questions, and different research questions are acknowledged as requiring broader methodological approaches. This integration of disciplines also makes new research questions possible to pursue: The fields expand! Also, combinations of methods such as *Methodological Triangulation* and *Mixed Method Research* (Teddlie and Tashakkori 2003a, 2003b; Johnson and Onwuegbuzie 2004) are increasingly acknowledged as

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5   This conflict regarding cross-cultural generalizations, in the intersection between archaeology and psychology, was particularly pinpointed by Hodder (1986: 30–32) in his criticism of Colin Renfrew's view of archaeological research regarding the human "mind". Renfrew promotes a position which bridges a natural science-derived and a historically relative point of view. In contrast, Hodder claims that each culture has its own cognitive processes, that Renfrew's position is internally contradictory, and concludes, "It is no longer possible to have a universal natural science theory and method which will allow secure inference and prediction from one historical context to another." (Hodder 1986: 32). Hodder here seems to confuse the term "cognitive processes" with the contents and products of these processes. The products of cognitive processes are culturally determined and influenced. "Cognitive processes" is a psychological construct referring to the cognitive functions of the brain, the human cognitive "share-ware", regardless of content and culture. (Humans even share many cognitive processes with other species.) Whether one learns computer use or bird trapping is culturally determined, but the learning processes (such as model learning and operant conditioning) are the same, and universal.

6   The "nature versus culture" conflict is also termed the "nature versus nurture" conflict.

creating more intriguing research designs and results. Different perspectives and methodologies evidently do not have to *compete*. On the contrary, they may *complete* our understanding of complex phenomena.

Problems? – Oh Yes!

Yet, there may be obvious problems and obstacles to good interdisciplinarity. First and foremost, researchers from various fields may be reluctant to move outside their "comfort zone", for various reasons. To spend one's time and funding on interdisciplinary projects may be hazardous in relation to job demands. "Publish or perish" is a constant threat. Secondly, it can be difficult to understand the scientific concepts and language of other fields. Communication and co-writing can be difficult. The solution is that one needs to study, read up on, and communicate with the disciplines that one collaborates with. There is no short-cut. One must simply expand one's perspectives and knowledge. (My team in SapienCE has frequent seminars, sometimes over several days, in order to enhance communication and understanding). A third problem is that journals may be very discipline-specific and can be reluctant, or simply unwilling, to publish interdisciplinary papers. As we review papers, we have here a great responsibility. We must dare to promote and recommend interdisciplinary papers. All that being said, I will add, from my own experience, that to engage in collaboration with other fields is not only demanding and challenging, but also very rewarding, mind-expanding, fascinating, and simply fun!

Does Archaeology Need a Hand Blender?

Frankly, in my opinion, archaeology is by its very nature interdisciplinary – perhaps *the* most interdisciplinary of all scientific disciplines. Archaeology is, and always has been, dependent on other disciplines to thrive and develop. And it develops further in that direction. A few examples will suffice. In collaboration with medicine, we find out what nutrition prehistoric people had, and what diseases and injuries they suffered. With geology (including tephrochronology) we study how ancient volcanic eruptions happened and what effects they had on human cultures (prehistoric as well as historical); and we can explain why certain stones were preferred for making stone tools. With acoustics we can unravel why certain areas in caves have decorations and signs of cultic behaviours. With zoology and botany we study the natural environment of prehistoric people, their diet, their agriculture and livestock, as well as reconstruct ancient gardens. With linguistics we study migrations and cultural diffusion. With history of religion we interpret ancient sacred locations, buildings, and objects. With psychology we outline what mental and social effects rituals produced. With history of art we date locations and cultural influences. With anthropology and ethnography we make analogue interpretations regarding family life and social organization from house structure to dwelling distributions. With chemistry we identify ancient colour pigments, discover how they were made and what their sources were, and reveal that classical, Greek and Roman, sculptures were polychrome. With numismatics we identify persons of power as well as trade routes, and date sites. With a DNA analysis we examine interbreeding of prehistoric peoples. With history, science of literature, and linguistics we decipher information from ancient texts. With climatology, oceanography, and glaciology we estimate sea levels, atmospheric conditions, and climate in ancient times, the natural contexts surrounding ancient peoples. And this list could go on and on and on.

The hand blender is my chosen metaphor for interdisciplinarity (the term used here to include inter-, cross-, and transdisciplinarity). As I described in the beginning, a hand blender can blend ingredients until their original identity is unrecognizable. That may be an overshot. I do not advocate disciplinary blending until unrecognition. After all, each researcher must take responsibility for the interpretations he or she makes. Yet, I think that the boundaries between the disciplines are still much too rigid. Unfortunately, scientific journals contribute to this situation by requiring field-specific contributions. Yet, archaeology, perhaps more than any other discipline, is by its very nature, an interdisciplinary science. And, as also other sciences do nowadays, archaeology should continue to expand and develop in that direction.

Conclusion

Yet, tensions in interdisciplinarity are obvious. A hand blender has sharp knives. Interdisciplinarity can be challenging, discouraging, demanding, perhaps even destructive. Posturing fights over theoretical issues can be lethal to progress, but can also spur it. Archaeology needs research that is inspirational and inventive. I believe that *a firm focus on the problem to be solved* is a key to reduce the interdisciplinary tensions and provide new inspiration. Problem-focused research will demand "postmodern eclecticism" as proposed by Tim Flohr Sørensen (2022, this volume) and "methodological anarchism" as proposed by Ribeiro (2022, this volume). An expansive, flexible, and pluralistic interdisciplinarity, in various forms, is what can lead archaeology beyond cyclopic single-theoretical and mono-methodological petrifying positions. Yes, archaeology does need a hand blender!

Acknowledgements

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