Tokens, Writing and (Ac)counting: A Conversation with Denise Schmandt-Besserat and Bill Maurer

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Abstract *In her foundational study of Neolithic clay tokens, the renowned archaeologist Denise Schmandt-Besserat identified that different token shapes represented different goods and were used in accounting and distribution. When these tokens came to be stored in sealed clay envelopes (likely representing a debt), each token was impressed on the outside of the envelope before being placed inside (thus allowing people to see quickly what was within). Three-dimensional objects were thus reduced to two-dimensional representations, the first form of writing (and contributing to cuneiform script). These clay envelopes in turn developed into pictographic tablets; here each token did not have to be impressed into the clay in a 'one, one, one' system, but instead quantity was indicated by a numerical symbol – abstract number was born. Much of Schmandt-Besserat's work can be found online at* https://sites.utexas.edu/dsb/. *Her book* How Writing Came About (1996) *was listed by American Scientist magazine as one of the 100 books that shaped science in the 20th century, and she remains an active expert on all things 'token'.*

Keywords: token; writing; number; dactylonomy; cognition; material culture

Denise Schmandt-Besserat is a renowned archaeologist and token specialist. She studied at the Ecole du Louvre in Paris before moving to America to take up a fellowship at the Peabody Museum of Archaeology and Anthropology at Harvard University. She then worked at the University of Texas, Austin from 1976 until her retirement in 2004.

In her study of Neolithic clay tokens, Schmandt-Besserat identified that different token shapes represented different goods and were used in accounting and distribution. When these tokens came to be stored in

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sealed clay envelopes (likely representing a debt), each token was impressed on the outside of the envelope before being placed inside (thus allowing people to see quickly what was within without opening the vessel). Three-dimensional objects were thus reduced to two-dimensional representations, the first form of writing (and contributing to cuneiform script). These clay envelopes in turn developed into pictographic tablets; here each token did not have to be impressed into the clay in a 'one, one, one' system, but instead quantity was indicated by a numerical symbol and abstract number was born. Much of her work can be found online at https://sites.utexas.edu/dsb/.

Schmandt-Besserat's book *How Writing Came About* (1996) was listed by American Scientist magazine as one of the 100 books that shaped science in the 20th century, and she remains an active expert on all things 'token' since her retirement. Denise Schmandt-Besserat and Bill Maurer both visited Warwick for the 'Tokens: Culture, Connections, Communities' conference held in June 2017 as part of the 'Token Communities in the Ancient Mediterranean' project. The project is funded by the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement No 678042). We seized this moment to talk about tokens, society, number, and cognition, both ancient and modern.
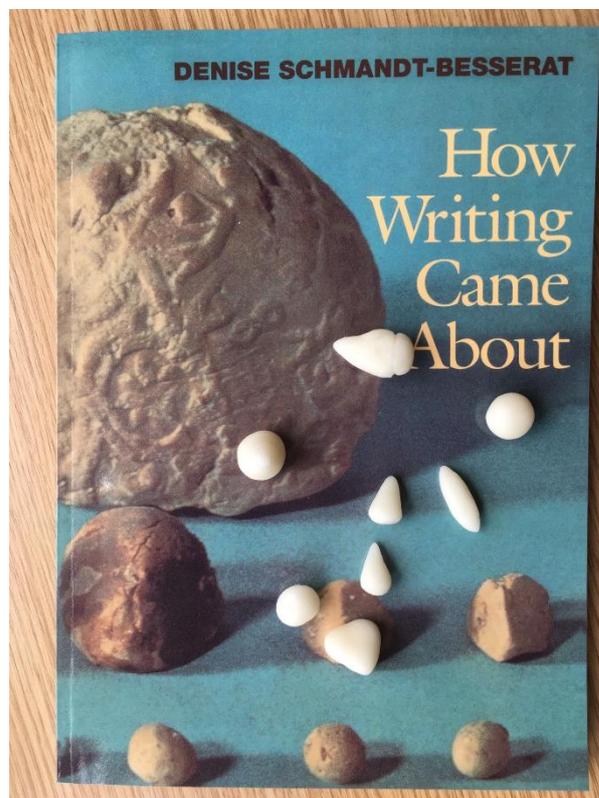
Figure 1: *How Writing Came About*, with model prehistoric tokens on top. Photo by the authors.

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How Writing Came About: The 'eureka' moment

Denise Wilding: Denise, you spent more than 40 years working as an archaeologist in the Middle East; to what extent has fieldwork there changed over time? It must have been quite a life experience, can you tell us a little about that?

Denise Schmandt-Besserat: I worked solo. When I started my study I had three boys at home, so going to fieldwork for three months was difficult for me. I did it twice, but as soon as I was in the token business it was you know…. When I did go to a site and excavate I did find 33 little cones [tokens] in my square. That was perfect. But it's only 33 little cones. When I went to museums I could accomplish a great deal in six weeks. I would be well prepared, would go to the museum, announce myself of course, and come with everything I needed. I was asking 'please show me the tokens'. So I was going to the storage, to either the attic or the basement, and I would be able to open drawers and see if the tokens were there. I knew the sites where they were likely to be, where my artefacts were supposed to be, and knew the period, so it was easy to open drawers and find them or not find them, so that was my way of going about it, and it was really a very efficient way of doing it. I told every person who would listen to me of that way of proceeding, and I don't know anybody who has done it. There were many people who had the same difficulty as I had, and it is a good way to invest four weeks or six weeks and to do so much. I was going from the minute that the museum was open. In the Middle East the museums close at 2 o'clock. Then, after 2pm, the bazaar was all mine! And I had a good feeling - I had stayed until the very end [i.e. until the museum had shut], I had a good conscience now, so it was fabulous. And I did well. The key was to do recording the way the museum staff wanted you to: wait when the key is not there, etc.

Bill Maurer: Do you think proceeding in that fashion, which gave access to tons more tokens than you would have had if you'd just been in your little square, is what helped lead you to the insight of the functions of these things?

DSB: Oh no, no, it was to prove it.

BM: So the insight came first?

DSB: Yes, absolutely.

BM: How did you arrive at that?

DSB: Well I had the *bonheur* of being at the Peabody Museum at Harvard for six years, and at that time there was a fabulous dinner for all people interested in material culture. People were there from MIT, Boston

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Museum, etc, and everybody who participated was working on materials: paper, bronze, artefacts, etc. It was extraordinary. My material was clay. I wanted to examine the use of clay before pottery. I met Mr Matson [Frederick R. Matson, Professor at the Pennsylvania State University until 1978], who was the 'Pope of Clay' at that time, when he came to the Peabody museum to do a talk. I asked to discuss my project with him, and he said 'lets go have breakfast tomorrow', and at breakfast he said these magic words: 'You cannot do that by books, you *have* to go to the Middle East.' Oh wow! I never dreamt of that, so off I went to the Middle East, systematically from museum to museum to museum, with the sites that were likely to have what I wanted. Then it was fabulous because I was looking for clay, so I was asking to look at the draws of Neolithic sites before 6000 BC, and that is where I found tokens - you know, they were clay. And usually in the draw there would be figurines. In those days people were smoking a lot so the tokens would be either in cigar or cigarette boxes next to the figurines, and sometimes it was just a couple, sometimes it was by the thousand. In Jarmo [Iraq] there were more than a thousand, so in a way I much preferred when it was a little amount rather than a lot. Each one had a little *Zettel* [slip of paper] that was all prepared before so I did not forget the firing, the colour, the temper, etc. So it was by looking at clay that I found those little objects, and then I knew they were important but I didn't know what they were, so I asked archaeologists that were excavating in the Middle East:

'Do you have little cones?'

'Oh little cones, I have lots of them.'

'What are they?'

'Oh well that's your job!'

So that is my destiny with tokens, and what an interesting life it gave me. From the beginning to when I was finishing - I was in Berlin for writing the conclusion to my volume - it was still piling up nicely, fitting, everything fitting. So that's my story.

Clare Rowan: But how did you actually come to the realisation about what these things were? Was there a lightning bolt moment?

DSB: There was a Eureka.

BM: You captured it - the Eureka moment!

DSB: One eureka moment was when I had the books of the German who worked with the raw tablets [**Archaische Texte aus Uruk, 1936-1994**, the publication of the cuneiform tablets from Uruk in Iraq] and I opened them and I saw all the tokens everywhere [i.e. the cuneiform script

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recalled the shapes made by the tokens when impressed into clay]. My husband called, and I told him, and he said those famous words: 'I think you are onto something big!'

From muscle to brain: tokens, writing and the development of civilisation

CR: What I find really fascinating about what you've pointed out is that the rise of farming and city-states, the development of civilisation, coincide with tokens (e.g. **Schmandt-Besserat, 2010**).

DSB: In fact, they don't coincide with this, they do it.

CR: Yeah, so they enable it.

DSB: Yes they *make* it. And the repercussions have no end. So the tokens bring writing, they become writing. This is civilisation. The people who were using tokens in fact were the computer scientists of the period. They were the brainy people. Before, the chief was the hunter who could kill most, but from tokens onwards the leadership were formed of brainy people. That makes an enormous shift you know, from muscle to brain, and it has an enormous influence on the leadership. And then that leadership, the more goods there were, we have *passage* from rural to urban, so that transported the world from muscle to cognition. And that is something I have not been able to pass on. I read a book about life in Neolithic communities. Well it should be full of tokens because they have been cognitively so important, but people have not yet said they were important.

Tokens, money and accounting: creating and grounding communities

CR: What I hope will come out in the conference (*Token Communities Conference 8-10 June 2017, University of Warwick*) is that the tokens of classical Athens enabled democracy, because how do you run a democracy? You need pieces to give people to vote, to be paid for jury duty, to actually create a governmental system, and I think you find this repetitively throughout history. The power of tokens! And I don't know if you know Bill, but are modern day tokens creating very specific types of community or structure?

BM: Absolutely, just to take Bitcoin as it's something that people think about a lot right now. On the one hand, Bitcoin has a lot of similarities with these ancient tokens in so far as essentially it's an accounting

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system, that's all that it is. There's a distributed ledger that exists on multiple nodes on a network, where computers - nodes on the network - are continuously updating the record of transactions, but really it's that record that matters. The record itself gets kind of manifested in the imagination that there are these coins, which there aren't right, they're just entries in this distributed ledger. But people need to have that sense of there being a circulating token I think, because that's what helps to stitch together the nascent community of people who participate in the system. It becomes almost, just like with your rulers in the past (nods to Denise Schmandt-Besserat), a kind of legitimation device for a warrant for that community, it proclaims its existence and proclaims in a way its virtue, by virtue of this token that goes back to an accounting system. So to me the really revolutionary thing here, whether it's the ancient tokens or something contemporary like Bitcoin, is that we see systems of accounting really grounding society by being the thing that makes possible and animates broader social cohesion, broader social constituencies for bringing other people in, in the way the Athenian tokens did, and also having rules built into it for participation - everybody needs to enter something in that ledger, everybody needs to circulate the token, or the tokens need to be passed on to warrant a transaction, which then warrants the whole thing that undergirds all of society.

So for the project that I'm currently doing on distributed ledgers I've been thinking about whether we are at the beginning of a revolutionary shift in how accounting is done; how do we think about other similar moments in the history of accounting? Say double entry and its connection to the slave trade as well as to the origins of capitalism 'quote unquote', or [go back] to the Neolithic and the transition to settled agriculture and the kind of shift in chieftainship that Denise has just talked about. So then for me the question is what are the implications for ideology, for leadership, for community today, given these shifts in accounting. And you don't have to go to Bitcoin, you can also just talk about credit cards, or you can talk about any other kind of non-state based payment system and what it does by creating closed networks that require someone to opt in to start playing the game, the way Bitcoin does. At the end of the day the state system is still the dominant one, it's still the one that has got prime position in the pyramid of money. Even with Bitcoin the reason that everyone is so excited about it is because it can be converted into lots and lots and lots of dollars, so the state system still is there.

But I think that this kind of work that Denise has done helps us then think about state money itself and how did state money arise out of such systems of accounting, how did the state or state agents basically insert themselves into what were essentially prestige economies, and require

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the return of their own token as a form of tribute, as a form of loyalty in the extension of their own sovereignty. And to me that's a transition that is fascinating: to think about the transition from small urban centres using tokens, and eventually using tablets, to bigger amalgamations that started using other forms of now materialised money. One thing that always fascinates me is that everyone talks about now the dematerialisation of money, but then you think, you look at human history and lets just start with 6000 BC until now, you only have material money from about 1000, 600 BC, until now. That's itty bitty. If you have a timeline, that's such a tiny little amount of time compared to back 6 millennia, so our own period of material money is really just a brief interregnum in a wider history of dematerialised accounting and reckoning systems. It's the whole old anthropological thing of just trying to imagine all these alternative possibilities that have been out there that we barely can even think about because all of our economics, all of our political science, all of our philosophy is defined by the same period as physical tokens of money. But there was all this stuff before, and there'll probably be all this stuff after if the world continues to exist.

DSB: From what you said, what struck me most is at the present time it is only the records of the transactions, and for 400 years, the first writing was also only that.

BM: Just transactional record keeping.

DSB: Three gold and three sheep, that kind of thing.

BM: Yeah. In the beginning was the receipt!

DSB: So we started the same.

BM: And it fits, because it also puts all these things that Denise writes about, that are so inseparable, of writing and reckoning, the development from concrete number of abstract number, all completely crystallised in this moment when the tokens go from individual things I count out to you to things that I impress on the clay. And it's like boom something happened right there, something huge happened right there. And then from the individual impressions, like five sheep, to the idea of fiveness that applies to anything, not just five sheep. It's such a huge type of revolution. How do we think about that?

DSB: And it is happening, the tokens and writing are happening in different parts of the brain, as I considered. So that is then bringing in a new part of the brain to function.

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Connectivity and the spread of token technology

DW: I think that Bill might have touched upon this a little bit, but Denise can you comment on the way that the tokens became systemised - how did everyone realise that *this* (token or sign) symbolised the same thing, or was it not quite as widespread as that? I'm just thinking how at the moment we have language and writing all over the world, but they're different, and not everyone can understand in the same way.

DSB: Well, I was famous in my class for saying 'I wish we could know', but when you have the first tokens in Syria in 9000 BC they are already in Iran [*Denise makes a psht sound to indicate the speed with which the tokens spread*]. That part you cannot catch. It has gone [*Denise clicks her fingers*]. You have the wave of farming, and the idea went *psht*. And it was a whole package. It was the idea, okay, of farming, of planting grain, it was the tools that go with it, it was the tools to prepare it, to prepare the food, and the tokens were there. And it is a package that went so swiftly, that you have no idea. And the first people who countered my study, they said 'it is impossible to have tokens (in this way).' Yes, it is possible, it was. But it seemed incongruous that it is not only the object but obviously the system that goes with it, and you are not able to know. I would say, but I would never put it in writing, maybe - along with other Neolithic developments - tokens started in Syria and went east. But there is no real possibility of knowing.

BM: You can imagine that because of the seasonality associated with agriculture that people…. well I imagine something like: 'Alright we just did the harvest. Tokens, tokens, huh, what am I gonna do now? Well there's nothing really to do, I'll just go up the river and see what I can find.' And then you meet other people and you say 'Hey we do this thing down there', and because of the seasonality associated with agriculture there are different kinds of time available to people both to come up with reckoning systems and to disseminate them. I'm just making this up, but that's always how I imagined it.

DSB: But with everything, every novelty, obsidian, etc., there are circles of nomads, and that must spread things very fast.

BM: That's interesting, so there's existing pathways, almost an existing infrastructure.

DSB: Yes.

CR: But how fast did it go? I know with the invention of coinage it's fifty years [to spread across the Mediterranean], extraordinarily fast, and it's the existing networks. It's astounding when you think about it, fifty years! So it would be interesting to know how fast these networks operate.

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DSB: (*shrugging*) So the seasonality, I see that. Farming spreads. In the Near East the winters are harsh, you have to store, and I think this is what needed to be managed. So the extraordinary thing is humans sharing food. The hunters and gatherers share food. The hunters come back to camp and distribute, and there is a tradition that 'mother in law gets this, brother gets this', etc., and there is no discussion and you don't need to count because it is 'one, one, one, one'. Okay, when you have farming they still share. There is communal food storage and it is the community that store together so that during the winter months everybody survives. The weak and the strong have their chance to make it to the end of the winter. Sharing food in the Palaeolithic period is easy, but then the tradition to share is there, very deep, and the farmers continue it, but it becomes very difficult. You have to plan the harvest, you have to harvest, you have to have the silos ready, etc. and that is what needs to be calculated. That is where tokens come in, to manage the communal resources. And those people who are going to manage the resources have tokens to keep track of whatever comes in, whatever comes out. It's always clear. And so this is I think the creation of tokens, for sharing. And I like this notion that humans always have shared. It is extraordinary, but then it becomes very difficult. Today we still share - the roads and the policeman, etc.

BM: It's an important point, because it points to the contemporaneous rise of something like administration, and the administrative state, which now is the roads and the policemen and other stuff besides.

Tokens, memory and the extended mind

CR: You mentioned briefly that in a sense tokens enable particular types of thinking and cognition, and I know you're familiar with the work of Malafouris and the idea that the brain in a sense can reside outside the body (***MET or Material Engagement Theory***). Do you think that the tokens were in a sense an extension in this way?

DSB: Yes definitely. That has been an important point.

BM: This goes to Keith Hart's point about money, that money is essentially an external memory device, and that again we get caught up in the stuff of money just because of the period in which we reside, but really it's this kind of external memory system that is what money does for us: an external memory of all our relationships and transactions and credits and debts with one another.

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DSB: And that is the way it can pass from one to the other. If the chief dies and he has all his tokens there, somebody who knows the system picks them up.

DW: We were wondering about the idea that objects have biographies and lives of their own to some extent. Quite often you find money that has been appropriated for another use, like pierced Roman coins. Is there any evidence that tokens are being used in this same way?

DSB: No, never. It is in my mind of course, tokens are only for administration, nothing else. They are not for trade. I'm constantly quoted about trade, but I have always said it is *not* trade, it is administration. It is taxes really, it is how much everybody must contribute. And it is interesting that until the first cities, until Uruk, tokens represent only farm products, mostly cereals, and oil etc., and immediately after cities tokens represent what is made in workshops - textiles, honey, bread, that kind of stuff. Tokens change from twelve shapes to some 300. For some we don't know what the shape represents, but those we can recognise are mostly textiles, or the raw material to make those things: metal, wool, this kind of thing.

Current trends in token studies: counting, abstract number and the human body

CR: Where do you see token studies going? What's next?

DSB: So Niloufar is doing tokens (Niloufar Moghimi, a PhD student at the University of Tehran, invited to Warwick to speak at the conference, but denied a visa by the UK Home Office). She has done her Masters thesis on tokens at one site. And then Lee (Karenleigh Overmann) has done the magnificent thing of continuing my catalogue (**Schmandt-Besserat, 1992**). She has added 2000 or more tokens I think. She has put it - what I could not do- on the computer. She has it all on a spreadsheet now, and we discussed yesterday that she will try to put it together with all of the tablets etc. and then put it online so that it is available to whoever wants it. And not only available to whomever wants, but all the archaeologists who find tokens can put them on there (i.e. contribute their finds). So people can do it by themselves. She's a student of Lambros (Dr Lambros Malafouris), so Lambros put her on the token catalogue, and you will see she has gone beyond my work. She's focused on cognitive archaeology etc., and we disagree very, very nicely. I find it interesting that we are dealing with the same things and coming to different conclusions, I think it makes it healthier.

BM: I want to know what the basis of the disagreement is now!

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DSB: Concrete number. She thinks number is abstract from the Neanderthal period. She has a *Current Anthropology* article (**Overmann, 2016**) and we discussed it yesterday. She sees abstract number from the beginning. She sees hand counting as very important, as a stage of counting. I have always heard that once you count you know you have 20, not the other way around. What is interesting is that I was working very hard on numbers in the 80's, and I am the product of that literature, and she is a product of the 2000's literature, and in the meantime there was 20 years and a lot happened.

BM: I actually have a fondness for dactylonomy, which is the word for finger counting.

CR: Those are Roman tokens behind you (gesturing to a sheet on her office wall); this is Roman finger counting on tokens. And the Romans go the other way - they put down the little pinkie finger to start with as one, and then two, three. And then four is my favourite.

DSB: She'll (Karenleigh Overmann) love that.

CR: We have a video ('Roman finger counting', https://www.youtube.com/watch?v=nkoOOg8en04). And we only have the full representation of Roman finger counting on tokens; it's the tokens that tell us how the Romans counted on their fingers, and we can actually reinterpret now a lot of other imagery.

BM: Can you then connect it with other technologies or not? My example is Luca Pacioli who is considered the father of double entry book keeping, also developed a special finger counting system, which I can't do (described in ***Summa de arithmetica, proportioni et proportionalita, Venice 1494***). It's amazing how people do this; it involved moving the knuckles.

CR: I think it's inherited, I need to check, but in the middle ages certainly it's inherited from the Romans, the finger counting, *le comput digital* (checking this reference a week later, the Roman system did influence finger counting in the Middle Ages, although six is conceptualised differently, and many of the gestures used might have been taken directly from Roman bone tokens, **Alföldi-Rosenbaum, 1971**).

BM: Pacioli's thing is if you turn it this way (*turns his hand sideways*) it's what you were doing on the abacus, because he was trying to rationalise it to make it fast and easy.

CR: That is fascinating.

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BM: And with dactylonomy, even today there are so many different ways of doing it. All you have to do is get a person from China to do it, and I forget how they do it, but it's completely different.

CR: Yeah, to me the idea of putting your little pinkie down for 'one' is completely insane, and I still can't do it.

BM: Using individual knuckles too is crazy, I can't even move my knuckles that way.

CR: Ok, on that note, thank you very much, we'll leave it here.

Conclusion

The above discussion demonstrates the continued use of tokens to facilitate different types of accounting and distribution, from the Neolithic to the present day. Tokens, in turn, contribute to cultural, societal and cognitive developments - the invention of writing, abstract number, or differing systems of governance. This interview took place just before the *Tokens: Culture, Connections, Communities* conference, and the next three days of discussion underlined much of what was said here. The role of tokens as externalised memory devices was particularly apparent: tokens might serve as mementoes of events or loved ones, as a record-keeping media in different distributive systems (at familial, local, regional and state levels), and, of course, in accounting. Connected to this is the role of tokens in creating, representing and consolidating different social hierarchies. Tokens also act in ways that are similar to money, but with one key difference: tokens are largely single use items (including the Neolithic tokens discussed here), whereas money is designed to be used repeatedly as it circulates from person to person. The discussion between Maurer and Schmandt-Besserat demonstrates just how timely the study of tokens of all varieties is: suddenly the 'new' Bitcoin and other payment media become part of a much longer tradition of systems without material money, dating back to the beginnings of human civilisation. As individuals seek to create different communities and exchange systems based on tokens (e.g. the 'DAO' discussed by **DuPont**), a historical understanding of the role and power of these objects is ever more necessary.

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Acknowledgements

List of Illustrations

Figure 1: *How Writing Came About*, with model prehistoric tokens on top.

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