

The Evolution of Technical Competence: Strategic and Economic Thinking

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Abstract

This article illustrates a series of changes in the archaeological record of Hominin.¹ It argues that these changes underlie the emergence of the capacity for strategic thinking. The article illustrates the formation of technical skills found in images, and then looks at the role of the archaeological and paleontological record. It argues that the key to the development of strategic thinking is the need to understand and engage in and coordinate increasingly heterogeneous environments.

Keywords: Human Evolution; Strategic Thinking; Archaeology; Hominin;

Introduction

In recent decades, discussion of human cognitive evolution has focused on social skills. Human abilities, such as language, are social. These social skills underlie the ability to achieve, such as innovation, cooperation, coordination, leadership, and cognition. What are the evolutionary origins of these abilities? Current hypotheses include the role of the brain and the evolution of "Machiavellian" abilities (1988), and the role of language (1996), or the role of social complexity. The evolution of human cognitive abilities has been almost entirely based on social behavior, and the evolution of human cognition has been almost entirely based on social interaction.

In some ways, a key to the archaeological record of hominid behavior is the evolution of the material world. Rich behavioral evolution of hominids is indicated by ecological and social changes as they become common (See for instance Odell, 1996).

This article is a combination of the evolution of the environment and of each: the evolution of cognitive abilities and the archaeological record. It takes a lead from 'Steven Mithen' (1996) "The Prehistory of the Mind," and the evolution of technology through the work of Thomason (Coolidge & Wynn, 2009; Wynn, 2002), which has the archaeological and biological evidence, including the evolution of cognitive abilities, and the evolution of technology.

Human cognitive evolution. Cognitive science and archaeology are equally illuminating.

On the one hand, human evolution, including the evolution of the environment, is a social process. The evolution of cognitive abilities is a social process. A social cognitive science is an embodied, embedded, and embedded in the environment, and the evolution of the environment is a social process, and the evolution of the environment is a social process.

This article looks at the evolution of human cognitive abilities: the evolution of the environment and the evolution of the environment. The evolution of the environment is a social process, and the evolution of the environment is a social process. The evolution of the environment is a social process, and the evolution of the environment is a social process.

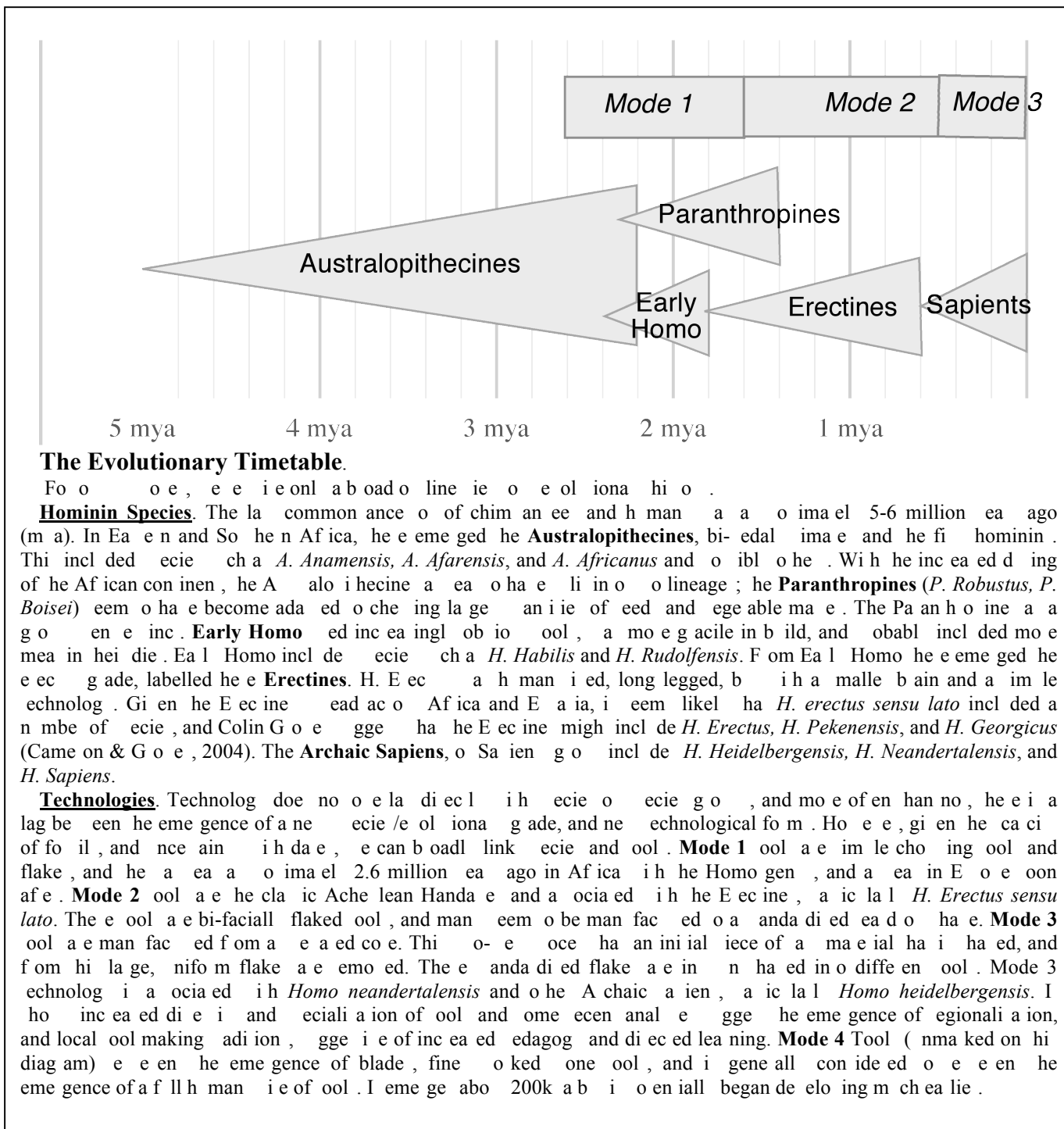
The Shared Legacy

The evolution of the environment is a social process. The evolution of the environment is a social process. The evolution of the environment is a social process. The evolution of the environment is a social process. The evolution of the environment is a social process.

Like the mammal-like evolution, a key to the evolution of the environment is the evolution of the environment. The evolution of the environment is a social process, and the evolution of the environment is a social process.

High level of social interaction, including the evolution of the environment, is a key to the evolution of the environment. The evolution of the environment is a social process, and the evolution of the environment is a social process.

¹ Recent genetic research has broadened the term *Hominid* to include the chimpanzee *Pan paniscus* and *Pan troglodytes*. The term *Hominin* refers to the Hominoidea, the biological classification including the chimpanzee and the human.



All are a human-like, and the general all hominid of basic tooling. Chimpanzee are not able to use tools of technology, in fact, making being a family member from a perspective of technological class (Andrews, Whalen, Schick, & Toth, 2009). The combination of manual dexterity and

operation of a human-like in long, and flexible, and the acquisition of learning behavior (Coolidge & Wynn, 2009). A human-like capable of learning long-term of chained action has led to a goal.² So

² Like extended childhood, complex signalling of social, human-like hominid-like. Neanderthalian context

and the homolog of the hominin in his capacity for multiple food acquisition, in the case of acacia in some cases in the tool and tool use, a part of a chained sequence of behaviour.

Given his common ancestor, we can estimate that a high degree of confidence has been before a archaeologist can see a tool in the archaeological record, that all hominins would be able to kill a species in the tool, tool manufacture, and manipulation of the material world. They were engaged in long-term activities foraging sequence. They were active in the sequence in the tool and material. And, the sequence was learned in a group context through observation of adults and peers, and were eventually fine-tuned on the local environment. All hominins had tool making and tool using capabilities.

The Australopithecines

With the dating of the East Coast of Africa, the discovery of the last common ancestor of chimpanzee and human found them to be in increasing numbers in the environment. In each of the hominins, the East Coast of Africa became ecologically available. The East Coast of Africa was a food, abundant, dense food environment and a good place, a well environment has been more open andannah like. Early bipedal hominins, the Australopithecine, such as *A. afarensis*, and *A. Australopithecus*, were in the heterogeneous landscape.

In the heterogeneous environment, both the activities foraging sequence and the local learning of the land and increasing importance. The activities foraging, abundant technical skills, many of them had an extended role in the Australopithecine foraging sequence. The local learning might have fine-tuned the kill of a new level of adaptive significance. A good illustration of tool using skills, such as the acquisition from abandoned carcasses, or the acquisition from the foot of a land, many of them had a critical adaptive edge that enabled them to flourish, regardless of the high density of the old food found them in.

The archaeological record of the kill is abundant in the field. Rock records of hominins are indicating a habit from geologically abundant material (E. S. Savage-Rumbaugh & Levin, 1994) in the close vicinity of the acquisition has high evidence of increasing

availability. However, we can see the increasing importance of the kill in the biological record.

For a while, the emergence of bipedalism would not be underestimated. One looked in the modern diet of the human cognitive evolution, bipedalism a long considered a major milestone in the evolution of the hominid (Landa, 1984, 1991). Bipedalism freed the hand, allowing for the development of

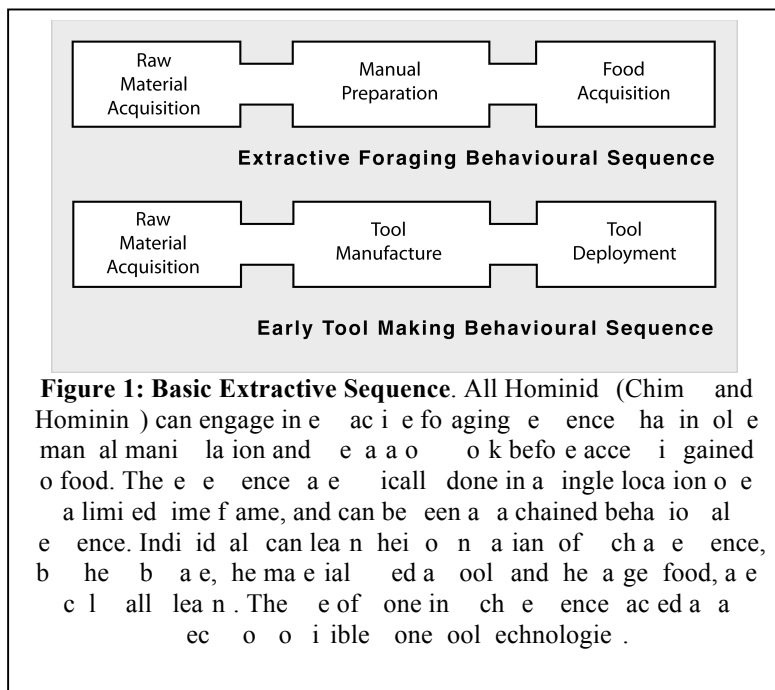


Figure 1: Basic Extractive Sequence. All Hominid (Chimpanzee and Hominin) can engage in the activities foraging sequence in the local environment and the acquisition of food before access gained to food. The sequence is typically done in a single location over a limited time frame, and can be seen as a chained behavioural sequence. Individuals can learn the operation of the sequence, but the basic, the material used to make the food, and the local learning. The effect of one in the sequence is a feedback loop on the tool technology.

generation, and the local food in the environment, is available to the hominins, such as the efficient. Increased availability of the efficient allows for the movement of good locations, and change the environment of the landscape markedly. The efficient use of the environment is a socially critical, a local food for the local population of an area of habit. One could forage in one location, but the environment in another. One might observe a food in one location, but consume it in another. This means that the behavioural sequence is a species-specific activity foraging of the old has to be able to accommodate the new opportunities for the local population.

It is also worth noting that the local food and food habits could be varied: Infants, carried on all, gain the environment to engage in the monitoring of the environment and the environment of the old (S. Savage-Rumbaugh, 1994).

The Australopithecine Legacy

The Australopithecine were among the most advanced chimpanzees. With the common ancestor of technologically aided food acquisition, the Australopithecine were active in the engaging in the technology of the environment. Critical, bipedalism has an operation of food and material of the distance of the Australopithecine world. Behavioural sequence is a new evidence of the environment

the similarity of long-term activities foraging sequence (See the book by H. N. and G. A.: G. A. in R. H. N. & G. A., 2002; G. A. in R. H. N. & G. A., 2004; G. R. H. N., R. Ledge, & G. A., 2007). What is interesting is the human in the combination of activities: high level of sociality, manipulation and activities foraging, long-term of offing dependence, a local and environment available in the environment, communication, and of the. No other organism has the "package" of kill.

to accommodate large groups. Individual hominids may have been able to exploit a greater number of ecological niches.

The hominin behavior of a mainly bipedal, active, engaging the physical world. It is not the emergence of the Oldoway culture, in eastern Africa, dated to 2.6 million years ago and associated with the emergence of the *Homo* genus, has been a defining characteristic of the archaeological evidence of tool use.

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The First Tools

We may think of rock as a failed bio, but in fact, rock is the high quality of one tool material can be a real and difficult to obtain. The early hominid tool making is not just about the collection of the material. Good quality materials are selected by the hominids, while the good material can be found in a significant distance, or made, for the best material. Some tool materials have come in some basic combination, such as the original form and behavior associated with tool use.

Once the cognitive combination, we can then understand the original tool making, given the likelihood of the early hominids. Take a simple example, the flake along a line in the men for a certain type of material formation. On the one hand, a new block from the edge of the rock or a long limb bone, and material is used. If the tool 'beak,' another rock can be picked and used. Once the activity finished, the tool can be discarded, a combination of aging in the environment, the material is used. Tool use is a challenge.

Some of the hominid tool making. Mode 1 tool (See Eolithon Time table) are simple cobble and flake rock. The hand flake has been made and developed locally, although the evidence of an association. Both in the Oldoway culture, and the tool use, the tool 'chea,' is the in the men engaged by the hand flake material.

In chimpanzee, the inability to use material long distance may have behavioral evidence from tool use and the collection of material with the hand flake. Material and age will be hand flake combination. With bipedalism, the ability to use both tool and oil may have hominid association evidenced in the environment.

However, the force of the behavioral chain of the hand flake and the material is a different area, in the long time frame, in the face of the evolution. The active aging evidence is no longer combined.

behavioural chain, even if still a herigid and reelected in essence, allow for the evolution of the ending, complete range.

This need to maintain behaviour of increasing distance aagg aag ab the increasing eanali of the eal Pleiocene (Foley, 1987). Seasonal eoce haeeo be haeed hen aailable, and ooniieaken. Fleibili in the face of changing eanali eoceold alo confedaaie ad an age on indiidal and go.³

The ic e ha emege i hen of agen i h lea ned behaio al chain aociaed i hool e, behaio nde conan ee o ech o accommoda e inc ea ing hical and emodal dilacemen. Indiidal ho can main ain behaio al chain o e longe diance, and e ha main ain chchain in the face of diac ion, old ha e mo e o o niie, and do be e, han ho e ha iml fo go ha he ee abo hen no confoned i h de ec iml.

Allied o hi i he fac haool become aailable. Regla, and ada iel alien ool man fac eand e, hile ill imle and oome e en elf-agh, old ne e hele ho ign of delibe a ion. The e enial oin o ga ho ee i ha behaio need o main ained i ho immediae iml, and ac o inc ea ingl di ee one. The de lo men of he e kill o ide a ba e on hich obildf he kill.

Mode 1 to Mode 2 Tools

The ic e h fa i ha of a ee o ed behaio al eence nde ome ee o become mo e fleible, main ained in the face of diac ion, and e fo med ac o inc ea ingl la ge emodal and aial diance. With he eme gence of the Eecine, hi ee become inc ea ingl ac e. What doe the a chaecological eod gge i ha ening a hi age of h mane ol ion? With ime gence o of Afica a he beginning of the Pleiocene, the Eecine inhabied a boad ahe of E aia fom We n E oe, ac o o China, don h o gh Indoneia. Thi a en of ead i one ha ed b he la ge ead o and o he mammal a hi e iod (Foley, 1991). The Eecine need fo food and a ma eial foool making, gge ha i dail and eanali ange ie needed o be inc ea ingl la ge, encom a ing di ee en ionmen. Addiional e idence i again h iological; *Homo erectus* lo e limb lengh inc ea ed o o ionall o bod i e com a ed o ealie hominin (Plimmet, 2004) o each ha of mode nh man, enabling boh longe diance o be a eed o e loil la ge ange, and o iblend ane nning o be a fea e of *Homo* behaio. The inc ea ed eanali of eal en ionmen mean *H. erectus* had o co e i h changing fo aging i a ion. Longe - em flc a ion in clima e, i h inc ea ing glacial/in e-glacial ccle, old fa o

³ A fa a I am a a e he ee i no e idence of eanali comming fo hominin a hi ime. Seasonal comming obabl eeie a de h of info ma ion indicaie of a ich cl al kno ledge ba e of a o nl lang age cold o ide.

go ha cold lean and ada o changing condion o e genea ion.

Homo erectus h a ea o be e loing inc ea ingl di ee habia, dealing i h con an change in habia ac o a io ime cale, and managing o do hi ac o la ge a ea.

The Cognitive Solution

With he gea e ange ie of the Eecine, and mo e a iable habia, behaio al eence ae nde inc ea ingl ee o ech. One ol ion i o allo he ee eence oac all beak: o a i ion he ee eence in o e a a e mod la ak. The ak can become mo i a ionall di inc.

With la e Mode 2ool, ee ee of e idence ha gge hi di aocia ion of ak i ha ening: Ra ma eial an o, and ool in e men. Ben Ma ick, in hi ae on he e ol ion of lang age, oin o he inc ea ing di ance of a ma eial an o a ion o e he Pleiocene (Ma ick, 2003). The a ma eial aociaed i h Mode 1ool ee a el an o ed mo e han a da' alk in di ance. B he la e Ache lean Mode 2, and in o Mode 3, an o di ance can in ome in ance become b anial 40-50 kilome ek o e en longe. Thi gge ha he economic of oneool ae becoming inc ea ingl im o an. I alo a ge haool e can no longe de end on a di ec ee ce al and behaio al link be een a ma eial and hei de lo men. Ra ma eial ac i ion and ool man fac e ee em o all and h icall di inc fom ool de lo men.

The econd ign of di aocia ion i he e idence of inc ea ing in e men inool. La e Mode 2 Ache leanool ho ign of inc ea ing e-och, and fine ok on heool. Some la e Mode 2ool eem o be almo *over* o ked, and ome ho no ign of ac al e. Kohn and Mi hen gge ha ell madeool ma ha e ac ed a e al ignal (Kohn, 2000; Kohn & Mi hen, 1999). Tool making can nde go elec ion inde endenl of de lo men. Be ha a i ma, he inc ea ing in e men inool bla e Eecine i no in di ee. One cold ce ainl a ge ha heool ee made inde endenl of de lo men con ide a ion.

Cognitive Linking

The an i ion fom Mode 1 o Mode 2 ee en he eme gence of behaio ha a e no co led o ge he b di ec iml, b linked cogniel. Lack of ace ecl de a flldi c ion of hi behaio al link, b one oin i alien he e: he de ie o make aool of a a ic la ee need no be ia *internal* ee en a ion of o enial e. Theool hem el e and hei eence i hin he go can ac a an e e nal mo i a ion fom ch of heool making ac i i. E e one el e ha aool, o ma be l ho ld oo. E e one el e i ca ing aool, o ma be l ho ld oo. Tool become *social* objec, in addi ion o hei ole aool. J a j enile Chim an ee migh be mo i a ed o imi ae a enal ac i ie ch a an -fi hing i h no

though of a food ead, he iml foolman face might ell be inde enden of i ac ical f nc ion.

Wha ee hen ih Mode 2 ool i he inc ea ing beha io al e a a ion of ool man face and ool de lo men , and he need fo a ne kind of link be een he o. Tool man face ing become le linked ool e o accommoda e he inc ea ing a i of a ma e ial , and inc ea ingl di e e and ea onal habi a of he E ec ine . The im e a i e o make a ool become inde enden of he e of he ool.

Mode 2 to 3 transition

The an i ion fom Mode 2 o Mode 3 ool (fom Lo e o Middle Paleoli hic in E o e, and Ea l o Middle S one Age in Af ica) o ghl coincide ih he end of he E ec ine , and he eme gence of he A chaic a ien . I a 'o ghl ,' beca e ool making cl e do no e e en he o of a ecie . Mode n h man go make Mode l ool oda . Diffe en go of hominin make diffe en elec ion of ool . Ne e hele , i i fai o a ha he eme gence of a ne e ol iona g ade i hin he hominin , he A chaic Sa ien , o ghl coincide ih he eme gence of a ne echnolog : Mode 3.

Mode 3 ool a e cha ac e i ed b a e a ed co e man face ing oce . Ra he han cea ing a la ge eno gh flake fom a cobble ha can hen be o ked in o a handa e, Mode 3 man face in ol e he delibe a e ha ing of a co e fom hich flake a e ck. I i in effec a o age man face ing oce : e a ing a ma e ial and man face ing ool become e a a e a k . Thi i a mo e efficien a of making ool , al ho gh nece ail mo e killed.

Addi ionall , Mode 3 ool al o ma k he a ea ance of mo e ob io l eciali ed ool . The e a e ne ool ed fo di inc i e a k , and in addi ion he inc ea ed e of al e na i e ma e ial ch a ood (Coolidge & W nn, 2009).

We al o ee e idence of a ma e ial an o di ance inc ea ing ill f he . Wi h he eme gence of la e A chaic Sa ien and *Homo sapiens*, he e an o di ance a o look like onenial ade o e , ih a ma e ial being ca ied ome h nd ed of kilome e fom o ce of l o lace of man face and de lo men (Again, ee he a icle b Ma ick, 2003).

A chaic Sa ien inhabi ed an inc ea ingl di e e ange of habi a . *Homo Neandertalensis* a ea o be a highl eciali ed, cold ada ed de cenden of ea lie A chaic Sa ien . A chaeolog ho di inc i e cl al adi ion a common lace.⁴ Gi en ha *Heidelbergensis* i likel o be he common ance o of bo h *Homo sapiens* and *Homo Neandertalensis*, ecie hich bo h ho e idence fo he ca aci fo lang age (Liebe man, 1998; Macla non & He i , 2004), i eem highl obable ha all he

A chaic Sa ien e e lang age ing ecie . To ha e en , and in ha fom, he ed lang age, i diffic l o a . Ne e hele , lang age i i e likel o ha e la ed a ole in fine ning cl al an mi ion, making egional eciali a ion o ible.

While m ch emain con o e ial, he a chaeological and h iological e idence cleal indica e ha A chaic Sa ien o e ed he ca aci o hink be ond he he e and no , and beha io all fle ibili abo e ha of he E ec ine .

The cognitive skills of Mode 3 tools

A hi oin o beha io al chain (a ma e ial ac i i ion → ool man face → ool de lo men) ha become a e of di c e e mod la beha io . U ing e a ed co e i elf allo a ma e ial ac i i ion and ool man face o become di inc . Pe a ed co e a e no onl efficien a of ing a ma e ial ; he al o od ce blank ha can be e ha ed o a a ie of end . Gi en he e ence of ooden ea , and he obable e a a ion of hide and o he ma e ial , he od c ion oce i elf eem o become deco led fom ecific e . Ho e e , hile he beha io of A chaic Sa ien a e inc ea ingl di c e e , he e idence al o gge ha he co ld accommoda e a egic and ac ical con ide a ion . Fo in ance, he e i ea on o hink ha diffe ing ea onal en ionmen ih concomi an change in a ailable e o ce (in game, o he food , o acce o a ma e ial) la ed a ole in A chaic Sa ien deci ion-making oce e . A chaeological e idence gge ha A chaic Sa ien co ld e loi ea onal e o ce (See fo in ance A e e al., 1997). Changing oli cal ela ion hi ih neighbo ing go co ld al o affec acce o e o ce .

A chaic Sa ien had o in eg a e info ma ion ac o a n mbe of domain , and m ch of hi info ma ion a no o imal; i a emo e, 'heo e ical' info ma ion. In making hei deci ion , A chaic Sa ien had o kee in mind he al e of a ca ce o diffic l o ob ain a ma e ial , ha o man face e, and o ible al e na i e e o ce ac i i ion a egie .

Multiple levels of control

The eme gen ic e of A chaic Sa ien i one of accommoda ing h ee diffe en e of info ma ion: b oadl a egic info ma ion, he ecific of a ic la a k , and he ela ion hi *between* a ic la a k .

Wa ne Ch i en en gge ha in killed a k , hi mo emen be een diffe en e of info ma ion i fe en l nece a (Ch i en en, 2009). Ch i en en ake a lead fom a ia ion cholog , he e he diffe en ia e be een he nece a le el of a a ene e i ed b ilo . To achie e he a io a k of fl ing, na iga ing, and comm nica ing, ilo need o b ing o he fo e diffe en kind of a a ene a diffe en ime . The need a ial a a ene o loca e hei ai c af ela i e o he g o nd, o he ai c af and de ina ion . The need em a a ene o manage he info ma ion abo hei ai c af : i f el le el , engine eed and o fo h. And finall , he

⁴ Hence he of ion of name fo a chaeological "cl e " fo hi e iod: he Mo e ian, he Ch el e onian, he A ignacian, e c.

need a k a a ene o g ide hem h o gh a a ic la
acion o e of ac ion a a a ic la ime, ch a landing.
A a io oin he e diffe en le el of a a ene ill
come o he fo e, g iding ac ion . The a io le el of
a a ene ill fi oge he , in eg a ing in o a big ic e.
Whil he ilo i foc ing on a k a a ene fo akeoff,
he e need o be backg o nd a a ene of em and
a ial info ma ion. One en i age a con an mo emen
be een he e e of a a ene : a d namic
em of con ol.

Wi h hi in mind, Ch i en en gge ha fo
killed ac ion e migh ee a ange of le el of
con ol. Ac o migh ha e ome hing e embling
a elf-model ha o ide info ma ion on
e onal goal and kill . A a egic a k model
o ide info ma ion abo he a egic con e
and he ole la ed b a c en a k i hin a
b oade e of a k . Then he e migh be a
i a ional model; he e am I no , and ha am I
doing. Finall , he e migh be he di ec mo o
con ol model ha con ol ac ion .

While e migh no age ee i h Ch i en en'
b eakdo n of con ol, hi nde l ing oin i
clea l im o an . Indi id al m in eg a e
info ma ion ac o a a ie of domain , mo ing
be een diffe en le el of a a ene and e of
info ma ion a diffe en age of beha io , and,
c ciall , allo ing diffe en le el of a a ene
o con ain and info m one ano he . The deg ee
of ca e I need in a mo o a k in one ool
man fac ei de enden on man fac o . Am
I making a ool ha e i e eliabili o e long ime
f ame , and making i o of a a e ma e ial? If o, hi
ho ld con ain m ac ion , making me ca io ,
ho gh f l and e a ed o in e a g ea deal of ime in he
man fac ing oce . Al e na i el , e ha I am among
ee , and e a e engaging in com e i i e ca enging i h
membe of he ca ni o e g ild. Ra ma e ial in he fo m
of la ge ock and cobble a e a ailable. A hi oin ,
in e men in a ool i n a an ed. The be ool a ock can
be i a mi ile and I effec i el h o a a ha I migh
a ano he ime hink of a a al able e o ce.

Wi h he eme gence of Mode 3 ool , e ee he
c lmination of a oce beg n b o A alo i hecine
ance o . A en ionmen became a iall and em o all
f agmen ed, indi id al did be e if he co ld main ain
in eg a ed b com le fo aging beha io ac o he e
di a a e one . Ideall , he main ained he e beha io al
chain in he face of di ac ion . O e ime, i h hi
f ndamenal kill idel e abli hed, indi id al did be e
if he co ld mod la i e he e beha io , main aining he
link be een he ele an ac cogni i el a he han
el ing on di ec im li. Acco ding o he a chaeological
eco d, hi a ea o ha e ha ened in o age . In he
fi age, ool e e made io o need. The ool e e no
eciali ed, gge ing ha he e e made fo a gene ic
f e, o he ool-making a k a in ome en e de-

co led fom he ecific of de lo men . Ne e hele ,
inc ea ing an o

le el con ain in lace. Hominin , fom hi oin on, a e a egic hinke .

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