

Approaches to a risk research on Roman antiquity

Why modern risk research does not consider antiquity.
Rolling the dice as the root of risk research.
How to calculate probability in antiquity.

PD Dr. Ulrike Ehmig
SFB 933 – TP A03-UP2

Ústav klasických studií
Masarykova univerzita
Brünn, 9.10.2017



UNIVERSITÄT
HEIDELBERG
ZUKUNFT
SEIT 1386

Perception and Handling of Risks in Roman Antiquity

1. Monday, 9.10.2017

The term “risk”. Why modern risk research does not consider antiquity. Rolling the dice as the root of risk research. How to calculate probability in antiquity?

2. Monday, 9.10.2017

Health risks: Sources of diseases and occupational risks. Indices of a reflected perspective?

3. Tuesday, 10.10.2017

Ex voto: the prevention of risks with the help of the gods.

4. Tuesday, 10.10.2017

Geschenke und Gelübde: *Donum dedit* und *votum solvit* in lateinischen Sakralinschriften

5. Thursday, 12.10.2017

Natural disasters: Sources of earthquakes, floods, famine and preventive measures.

6. Thursday, 12.10.2017

Risks in seafaring and ancient economy. The variety of measures in a central field of ancient life. From risk-minimizing contracts to magical practices.

What is “risk”? Why modern risk research does not consider antiquity?

Risk: calculable probability of damage of a certain size

Risk: calculable probability of damage of a certain size

1250 „De Vetula“: list of the number of possible combinations of the dots for rolling three dices

Risk: calculable probability of damage of a certain size

1250 „De Vetula“: list of the number of possible combinations of the dots for rolling three dices

Mid 17th century „Logic of Port Royal“: assessment of future events not only according to possible advantages or disadvantages, but equally to its probability

Port Royal des Champs near Paris



Painting by Louise-Magdeleine Horthemels, ~ 1710

Risk: calculable probability of damage of a certain size

1250 „De Vetula“: list of the number of possible combinations of the dots for rolling three dices

Mid 17th century „Logic of Port Royal“: assessment of future events not only according to possible advantages or disadvantages, but equally to its probability

1713 Jakob Bernoulli „Ars conjectandi“: first calculation of probability and law of large numbers

JACOBI BERNOULLI,
Profess. Basil. & utriusque Societ. Reg. Scientiar.
Gall. & Pruss. Sodal.
MATHEMATICI CELEBERRIMI,
ARS CONJECTANDI,
OPUS POSTHUMUM.

Accedit

TRACTATUS
DE SERIEBUS INFINITIS,

Et EPISTOLA Gallicè scripta

DE LUDO PILÆ
RETICULARIS.



BASILEÆ,
Impensis THURNISIORUM, Fratrum.

clo lccc xliii.

First calculation of probability

Jacob Bernoulli, *Ars conjectandi*
(Basel 1713)



Risk: calculable probability of damage of a certain size

1250 „De Vetula“: list of the number of possible combinations of the dots for rolling three dices

Mid 17th century „Logic of Port Royal“: assessment of future events not only according to possible advantages or disadvantages, but equally to its probability

1713 Jakob Bernoulli „Ars conjectandi“: first calculation of probability and law of large numbers

30s of the 18th century. Daniel Bernoulli: one and the same risks are perceived differently

Risk: calculable probability of damage of a certain size

1250 „De Vetula“: list of the number of possible combinations of the dots for rolling three dices

Mid 17th century „Logic of Port Royal“: assessment of future events not only according to possible advantages or disadvantages, but equally to its probability

1713 Jakob Bernoulli „Ars conjectandi“: first calculation of probability and law of large numbers

30s of the 18th century. Daniel Bernoulli: one and the same risks are perceived differently

➔ Basics of modern risk research

Modern definition of Risk: calculable probability of damage of a certain size

Modern definition of Risk: **calculable probability** of damage of a certain size

➔ no risk research for the period before the middle of the 17th century

➔ no risk research for antiquity

WORLDWIDE BESTSELLER

AGAINST THE GODS

THE REMARKABLE STORY OF RISK



PETER L. BERNSTEIN

Copyrighted Material

Peter Lewyn Bernstein

Against the Gods. The remarkable story of risk (1996)

Edwin G. Booz Prize for the most insightful, innovative management book published in 1996

Clarence Arthur Kelp/Elizur Wright Memorial Award from The American Risk and Insurance Association (ARIA) as an outstanding original contribution to the literature of risk and insurance 1998

more than 500.000 sold copies

Modern definition of Risk: **calculable probability** of damage of a certain size

➔ no risk research for the period before the middle of the 17th century



But there exist numerous studies with usable approaches to a risk research on antiquity.

In the following sessions, we will see some examples from different spheres of life.

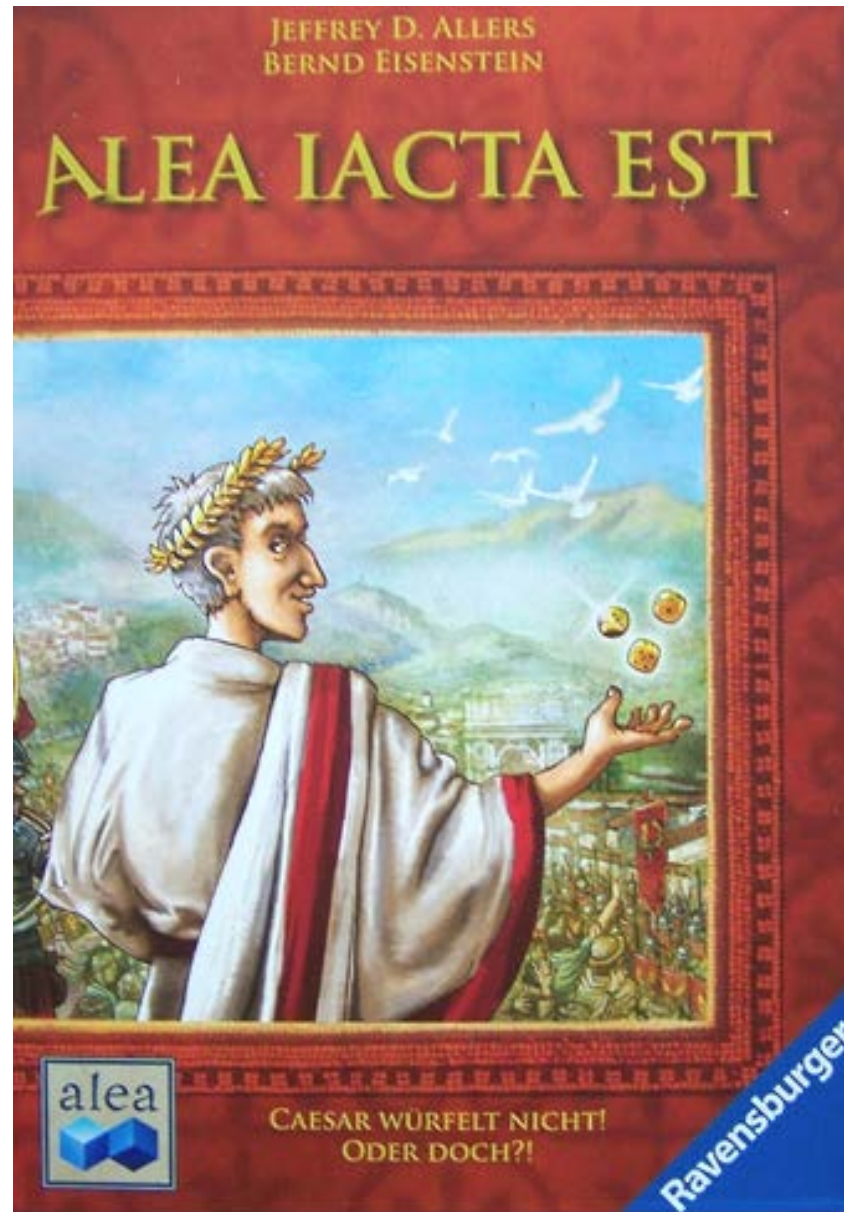
First, however, we will discuss the roots of the ancient understanding of risk and probability.

What role does the dice play for the idea of risk in the ancient world, and how did the Ancient deal with probability?

Is it necessary that probability can be calculated to deal rationally with risks?

In Latin:

The meaning of „risk“ is closely linked to the term *alea* / dice



Aldius *nom. gent.* CORP. IX 1432 (*Aequi Tutio*) C. Aldio Barbato C. Aldius Agr(ri)cola fil. fec. cf. Aldius sub **Allius?** *Otto*
Aldualuhs -i *cogn. vir. germ.* CORP. XIII 6256 (*Barboto-
magi, saec. VI/VII*) hic pausat corpus Aldualuhs, cuius anima gaudet
in caelo. *Diehl.*

Alduasubis v. Dubia.
Aldunus, -i *nom. vir. cell.* INSCR. christ. Leblant Nouv. Rec. 241
Alduni. *Jacobsohn.*

Alē vel **Alae** *opp. Ciliciae*. PLIN. nat. 5, 99. *cf. STEPH. BYZ.*
*sub Alai: nei rñs Kίλίκιας δὲ πόλις, κληθῆναι τὰς κρημῶνας Ἀλαί.
καὶ δὲ τοῦτον Ἀλαίαν καλεῖται.* *cf. Aleus* *Diehl.*

Alēa, -ae f. [*orig. inc.?* sunt qui conferant e. ind. aksāh 'alea',
v. *Leo Meyer, Vergl. Gramm. d. griech. u. lat. Spr. 7 454. Th.*].
ISID. orig. 18, 60 **alēa**, id est ludus tabulae, inventa a Graecis in
otio Troiani belli a quadam milite nomine Alēa, a quo et ars no-
men accepit (*sim.* GLOSS. IV 14, 26. 205, 49. 473, 51. V 165, 17. *breuius*
V 410, 3). GLOSS. *καβέλα, κίβος, νότος, κορριάς, τεφί (anglos).*
V 424, 21 genus ludi: 262, 22 ubi nummi ad ludendum. 165, 15 **alēa**
quasi bellum quod alterum facit victum, alterum victorem. 165, 16
tabula ad ludendum eo quod alter alio victo vincet. 490, 46 *lect.*
inc. cf. 1. alēo forma alta: CORP. IV 2119 (*cf. ALBIN. gramm.*
VII 207, 14) et *saeptius in codicibus, ca. gr. VARRO rust. 1, 4, 3 cf.*
PLIN. p. 1523, 34. *inde a PLAVTO in usu est.*

proprie: v. Mau, Leonhard, Hartmann, PW. I 1358 sq.
ludere **alēa**, **alēam** *sim.*: GLOSS. II 351, 12 *κορριά* **alēam** ludo.
356, 23 *καβέλα* **alēa**, **alēam** ludo (III 76, 44). II 14, 33 **alēam** ludo
κορριά, *καβέλα*. *TRITUS* or. frg. *Maer. sat. 3, 16, 14* ludat **alēa**
studiose, delibati unguentis, scortis stipati. *Cic. Phil. 2, 56* vel in
foro **alēa** ludere. *CARM. Suet. Aug. 70* postquam bis classe victus
naves perdidit, aliquando ut vincat, ludit assidue **alēam**. *Ov. trist.*
2, 471 sunt alii scriptae, quibus **alēa** luditur, artes. *PAVL. FLEST.*
p. 52 *cyblos* genus piscis, quia piscantes id genus piscium velut
alēam ludant. *SEN. apocol. 14* **Aeacus** iubet illum **alēa** ludere pertinuo
fratillo. *IVV. 8, 10* si luditur **alēa** pernox. *SVET. Claud. 33* **alēam** studio-
sissime lusit; de cuius arte librum quoque emisit; solitus etiam in
gestatione ludere, ita esse do alveoque adaptatis, ne lusum confunde-
retur. *Nero 30* quadringentis in punctum sestertius **alēam** lusit.
PAVL. dig. 47, 10, 26 si **alēam** lusit. 11, 5, 4, 2 quod in **alēa** lusum
est. 11, 5, 4 pr. (?). *EDICT. praet. Vlp. dig. 11, 5, 1 pr.* apud quem **alēa**
lusum esse dicitur. *ibid.* **alēa** ludendae causa. *VLP. dig. 11, 5, 1, 2.*
ANTH. 323, 1 ludis, nec superas, **Vitor**, ad **alēam**. *PS. CYPR. alēat. 8*
alēa ludas (*ibid.* **bis** **alēa** tabula qui ludit). 11. *CAPITOL. Ver. 4, 6*
fertur et nocte perpetui **alēa** lusisse. *SCHOL. Hor. carm. 2, 1, 6.*
SVET. Claud. 39 multos . . . ad **alēae** lusum admodum iussit (*cf. Cal.*
41 ne ex lusu quidem **alēae** compendium spernens). *MAER. sat. 1, 7,*
22. *AMBR. Tob. 11, 39* victus **alēa** ludo. *COB. Iust. 3, 43, 1 pr.* **alēam**
lusus. *PLAVT. Curc. 355* talos poscit sibi in manum, pro-
vocat me in **alēam**, ut ego ludam. 609 elusi militem, inquam, in
alēa. *RHET. Her. 4, 21, 29* hic, quos homines **alēa** vi(n)dit, eos ferro
statim vincit (*cf. CORP. IV 2119* vici Nuceriae in **alēa** *denarios tot*
fide bona. *sic* perdere in **alēa**: *Cic. Phil. 2, 56* *POMP. dig. 17, 2, 59, 1.*
Cic. Catil. 2, 10 quod si in vino et **alēa** commissiones solum et scorta
quaerent (*Phil. 13, 24* in lustris, popinis, **alēa**, vino tempus aetatis
omne consumpsisses. *cf. COLVM. 1, 8, 2* *PLIN. paneg. 89.* *LAMP. Comm.*
9, 1 in convivia et **alēam** convertit *sumptum*). *Cic. Phil. 2, 56* homi-
nem . . . lego, quae est de **alēa**, condemnatum (*et bis* *ibid.* *cf. HOR.*
carm. 3, 24, 65 votiva legibus **alēa**. *PS. CYPR. alēat. 6* **alēa** est quam
lex odit. *AMBR. Tob. 11, 38, 11, 39* **alēa** . . . legibus obediendi *Humnos*.
ISID. orig. 18, 68 de interdictione **alēae**. *cf. alēarius*). *HOR. epist. 1, 18,*
21 quem damnosa **Venus**, quem praecipis **alēa** nudat. *Ov. ars 1, 452*
non cessat perdere **luser** et revocat cupidas **alēa** saepe manus. *Pont.*
1, 5, 46 nec tenet incertas **alēa** blanda manus (*MART. 4, 14, 7* blanda
vagus **alēa** December). 4, 2, 41 nec vinum nec me tenet **alēa** fallax (*SEN.*
apocol. 16). *Ov. rem. 146* *NVX 75.* *SEN. dial. 12, 17, 4* *Caligulae* lugentis
sororem **alēa** solacium fuit. *benef. 7, 16, 3.* *PERS. 5, 57* hic campo
indulget, hunc **alēa** decoquit. *PLIN. nat. 14, 140* quantum **alēa** qua-
sierit, tantum bibit. *MART. 4, 66, 16* 13, 1, 8, 14, 15, 2 dum sit maior,
quam talis, **alēa** saepe mihi. 14, 19 (18), 1 **alēa** parva nunc et non
damnosa videtur. *QVINT. inst. 6, 3, 72* *IVV. 1, 88, 11, 176* turpis. 14, 4
damnosa. *TAC. Germ. 24* **alēam** . . . sobrii inter seria exercent (*LAMP.*
Comm. 2, 8). *SVET. Aug. 70* **alēae** indulgens (*PS. AVR. VICT. epit. 1, 21*
studiosissimus **alēae** luser). 71 **alēae** rumorem nullo modo expavit.
Cal. 41 glorians . . . nunquam se prosperiore **alēa** usum. *Claud. 5*
alēae infaniam subit. *Vit. 4* *Claudio* per **alēa** studium familiaris.
Dom. 21 **alēa** se oblectabat. *FRONT. p. 128, 23 N.* **alēa** in castris fre-
quens. *PAVL. dig. 44, 5, 2, 1* si in **alēa** rem vendam, ut ludam. *VLP.*
dig. 22, 3, 19, 4 in **alēa** gestum esse contendatur. *GELL. 14, 1, 24* cur
tandem non de **alēa** quoque ac de calculis et alveolo audent dicere,
quisnam ibi ludendum vincat? *TERT. pall. 5* dabo catharticum . . .
alēae *Curii* et violentiae *Antonii* (*cf. alēator*). *CYPR. Demetr. 10*
alēa prodigus (*cf. GLOSS. sub 1. alēo p. 1523, 17*). *PS. CYPR. alēat. 5*
alēae tabula (6. 7. 8). 9 quando se **alēae** auctorat. 11 fuge **alēam**
ibid. **alēam** noli respicere. *CAPITOL. Ver. 10, 8* **alēae** cupidissimus.
AMM. 14, 6, 25 pugnaciter **alēis** certant. *AMBR. Tob. 11, 39* ad unum

alēae iactum. *PHYSIOGN. 29* **alēae** dilicos (88. 103 *SIDON. epist. 8,*
11, 8). *SIDON. epist. 1, 8, 2* student **plae** senes, **alēae** iuvenes.

proprie: alēator et transtare: cf. Otto, Sprichw. p. 12. *SVET.*
Iul. 32 **alēa** **alēa** est (esto *Erasmus*), inquit (*ἀνεπίφθονος κίβος*). *cf.*
PIETRON. 122 vers. 174 iudice *Fortuna* cadat **alēa**. *AMBR. epist. 82, 8*
in certi eventus quaedam, ut dicitur vulgo, **alēa**. *VARRO*
rust. 1, 18, 8 temptare quaedam sequentes non **alēam**, sed rationem
aliquam 1, 4, 3 ubi salubritas non est, cultura non aliud est atque
alēa (*alia trad.*) domini vitae ac rei familiaris. *CIC. div. 2, 36* non
perspicitis **alēam** quantum esse in hostiis deligendis? *HOR. carm.*
2, 1, 6 periculosae plenum opus **alēae** (*cf. PORPH. ad L.*) sat. 2, 5, 50
peraro haec **alēa** fallit. *Ov. ars 1, 376* talibus admissis **alēa** grandis
adest. *Liv. 1, 23, 9* non contenti libertate certa in dubiam imperii
servitūque **alēam** imus. 31, 35, 1 tam celerem **alēam** universi certami-
nis timens. 37, 36, 7 tutam fore belli **alēam** (*HERGES. 3, 17* brevi
damno totius belli **alēam** lusi. 5, 30 varia atque incerta bellorum
alēa. *COD. Theod. 7, 17, 1 a. 412* istis . . . ad belli **alēam** praeparatis.
COMMENT. Lucan. 7, 107 **alēam** belli temptare. *SCHOL. Hor. carm.*
2, 1, 6 cogit **alēa** belli). *Liv. 40, 21, 6* filios non commissurum in **alēam**
eius . . . casus (42, 50, 2 ut in **alēam** tanti casus se regnumque daret.
AMM. 24, 2, 14 omnes **alēae** casus experiri festinans). 42, 59, 8 ne . . .
summam rerum temere in non necessariam **alēam** daret. *MANTL.*
1, 916 repetitaque rerum **alēa**. *SEN. clem. 1, 1, 7* magna adibat **alēam**
populus Romanus, cum incertum esset *eqs.* (*benef. 3, 11, 1*). *epist.*
58, 34 non exigua temporis mercede magna rei **alēam** redimit.
99, 12 nihil ille perdidit nisi **alēam** in damnum certiorum. 117, 20
subito (-to *codd.*) huius voti **alēam** (*cf. nat. 4* praef. 7 *ubi* **alēam**
pro *litē* *Muretus* *COLVM. 3, 21, 6* primum negligentiae vindemiae
victoriae **alēam** subeat. *APVL. met. 4, 15* ancipitis machinae subivit **alēam**).
COLVM. 1 praef. 8 an bellum per obsessa maris et negotiationis **alēa**
sit optabilior. 8, 2, 5 rixosarum avium lanistae, cuius . . . patrimonium,
pignus **alēae**, victor gallinae pyles abstulit. *LYCAN. 6, 7* placet
alēa fati (6, 603). *PLIN. nat. praef. 7 M. Tullius* extra omnem ingenii
alēam (*taliam* *codd.*) positus. *FRONTIN. gram. p. 41, 6* magna . . . **alēa**
est, *litē* ad interdictum deducere. *ANTH. 198, 53* ubi quaeritur **alēa**
mortis. *POMP. dig. 18, 1, 8, 1* aliquando . . . et sine re venditio intel-
legitur, veluti cum quasi **alēa** emitur (*PAVL. dig. 18, 4, 7*). *SCAEV.*
dig. 22, 2, 5 si modo in **alēae** speciem non cadat. *GELL. 18, 13,*
1 Saturnalibus Athenis **alēa** quadam festiva et honesta lusitabamus
huiuscemodi. *AMM. 26, 6, 12* **alēam** periculorum omnium iecit abrupte.
CLAUD. 21, 365 nec constitit **alēa** castris nutatura senel. *SIDON.*
epist. 4, 6, 3 bene factum est, quod anceps iter . . . distulitist neque
intra iactum tantae **alēae** status tantae familiae fuit. *CASSIOD. var.*
3, 1, 1 cavete subito in **alēam** mittere quos constat tantis temporibus
exercitia non habere.

derivata: alēaris, alēator, alēo subst. et verb. Ihm.
1. (**Alēa**) *nom. vir. v. s. alēa p. 1521, 15.*
2. **Alēa**, -ae, *Alēa*. *opp. Arcadiae*. *PLIN. nat. 4, 20* (*ubi trad.*
alēae, **alēae**). *STAT. silv. 4, 6, 52* *qualem Herculem* **Alēae** (*taleae Matr.*)
lucis vidit *Tegenea* sacerdos. **Alēa** *Minerva* *ibi culta*: *STAT. Theb.*
4, 288 templumque **Alēae** memorale *Minervae*. *cf. Wentzel, PW.*
I 1358, 4. *heros oppidi eponymus* **Aleus**, -i, *Alēos*. *HYG. fab.*
162 p. 16, 1 Auge, **Alei** filia (98 p. 93, 3). 14 p. 46, 24 *ubi trad.* *ogei*.
Exc. barb. p. 240, 4 ed. *Frick* **Aleu** *gen. abui in nom. serv.* *CORP.*
VI 156 (a. 105) minister. *cf. Thrämer, PW. I 1365.* *Diehl.*

alēarius, -e *ab* **alēa**. *CARL. AVR. chron. 2, 1, 25* in os immitti-
mus ceram vel tabellam **alēarem** aut feruleam et ductu contrario
fasciolarum corrigere temptamus depravata.
alēarius, -a, -um *ab* **alēa**. *PLAVT. Mil. 164* ut ne legi frau-
dem faciant **alēariae** (*cf. alēa p. 1521, 55* *sqq.*). *AMM. 28, 4, 21* ami-
citiarum **alēariae** (*plur.*). *Ihm.*

Aleasiumara, -ae *nom. mul. cell.* *CORP. XII 1124* (*Aptae*) **Alea-**
siumarae *Viri f.* *Diehl.*
alēator, -ōris *m. [ab* **alēa**. *Th.*]. *GLOSS. κορριάς, καβέλας,*
κίβος, πασιμ. *IV 474, 1* **alēator**: luser cupiditatis (*sic* *saeptius*).
II 566, 8 *tebleri* (*anglos.*, *cf. V 338, 20*). *V 264, 39* v. 2. **alēo**. *NOT.*
Tir. 42, 35. *PLAVT. Rud. 359* o Neptune . . . nec te **alēator**
nullus est sapientior; profecto nimis lepide iecisti *bolum*. *PYLLI. A 33*
alēator quanto in arte est potior, tanto est nequior. *cf. Otto, Sprichw.*
p. 13. *Cic. Verr. 2, 33* lenonum, **alēatorum**, perductorum nulla
mentio fiat (*LACT. inst. 6, 17, 19*). 6, 33 **alēatoris** *Piacentini* castra
commemorabuntur. *Catil. 2, 23* omnes **alēatores**, omnes adulteri (*cf.*
QVINT. inst. 2, 4, 22 *TRYPH. dig. 50, 16, 225*). *Phil. 3, 35* impudicus,
alēatoribus, ebriis servire (2, 67). 5, 12 ille legit **alēatores**, legit exu-
les, legit *Graecos*. 8, 26 cavet mimis, **alēatoribus**, lenonibus. *off.*
3, 91 mendacem esse, **alēatorem**, furacem, ebriosum. *Att. 14, 5, 1.*
IMP. AVG. epist. frg. Suet. Aug. 71 lusimus per omnis dies forumque
alēatorum (*codd.*, -rium *edd.*) calcicimus. *ASCON. tog. cand. 96* *Curius*
. . . notissimus fuit **alēator** (*cf. TERT. pall. 5*). *MART. 5, 84, 5* **aedilem**
rogat **udus** **alēator**. *QVINT. inst. 2, 4, 22* **alēator** pauper. *DIG. 11, 5*
de **alēatoribus**. *VLP. dig. 21, 1, 4, 2* **alēatores** et **vinarios** (21, 1, 25, 6).
21, 1, 19, 1 **alēatorem** . . . furem. *PORPH. Hor. epist. 1, 8, 21.* *PS. CYPR.*
alēat. 1. 6 o **alēatorum** noxia . . . nequitia. *ibid.* **alēatores** cum pro-
stitutis mulieribus . . . nocturnas vigiliis . . . celebrant. 8. 9. 11 esto

Thesaurus Linguae Latinae I / 7, München 1991, s.v. *alēa*

Alea used in a metaphoric sense in:

- historiography (Livius, Ammianus Marcellinus)
- administrative literature (Cassiodorus)
- specialist texts (Plinius, Frontinus, Varro, Columella)
- poetry and novels (Horatius, Ovidius, Petronius, Apuleius, Claudianus)
- letters and philosophical discourses (Cicero, Seneca, Sidonius Apollinaris)
- church historical and theological writings (Ps.-Hegesippus, Ambrosius)
- legal texts (Digesta, Codex Theodosianus)

Alea used in a metaphoric sense to describe risks

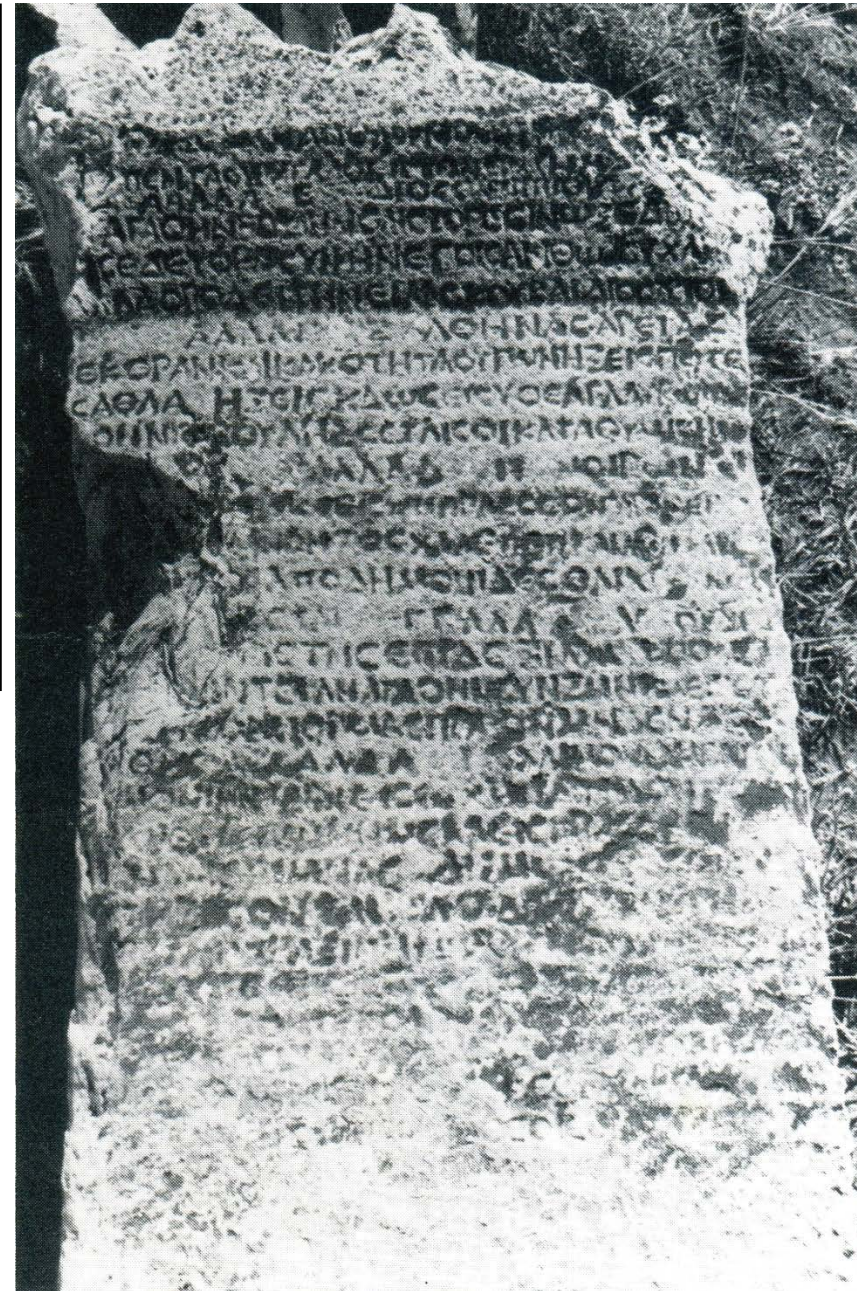
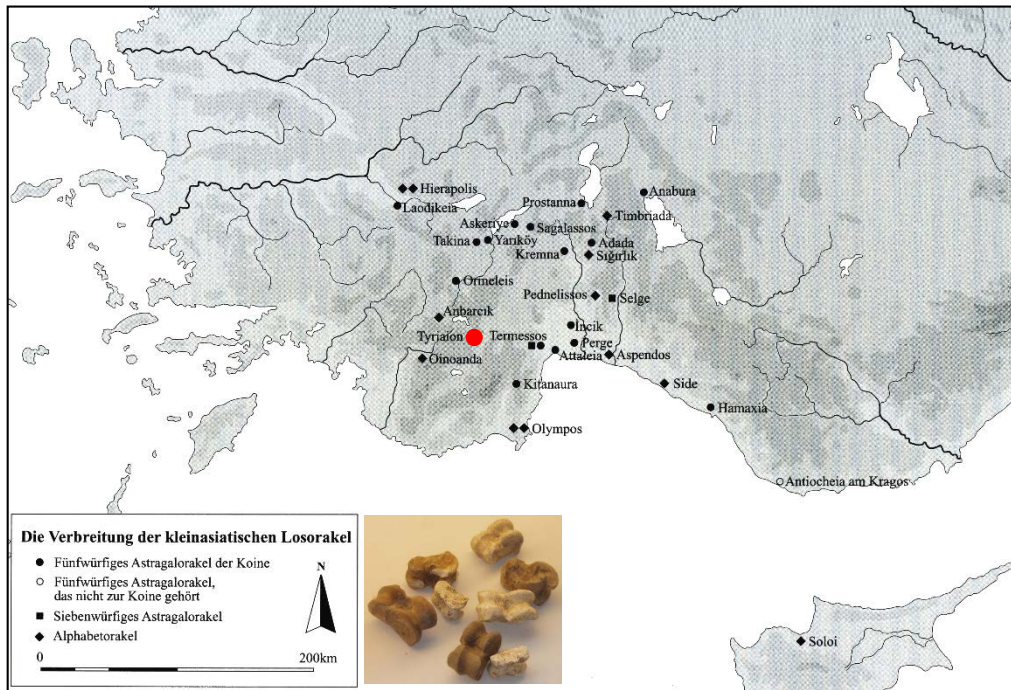
mainly from a Roman-Italian upper class

- in war: Hor. carm. 2, 1, 6 : *opus plenum periculosae aleae*
Ps.-Heges. 3, 17. 5, 30 : *varia et incerta bellorum alea*
Cod. Theod. 7, 17, 1 : *ad belli aleam praeparatis*
Cassiod. var. 3, 1, 1 : *in aleam mittere*
- in political issues: Liv. 42, 50, 2 : *ut in aleam tanti casus se regnumque daret*
Sen. clem. 1, 1, 7 : *magnam adibat aleam populus Romanus*
- in agriculture: Colum. 1 praef. 8 : *maris et negotiationis alea*
Varro rust. 1, 4, 4 : *alea domini vitae ac rei familiaris*
Colum. 3, 21, 6 : *neglegentiae vindemiatoris alea*
- when buying and selling: Pomp. dig. 18, 1, 8, 1 : *emptio spei*
- in philosophical discourses: Sen. epist. 99, 12 : *nisi aleam in damnum certiozem*



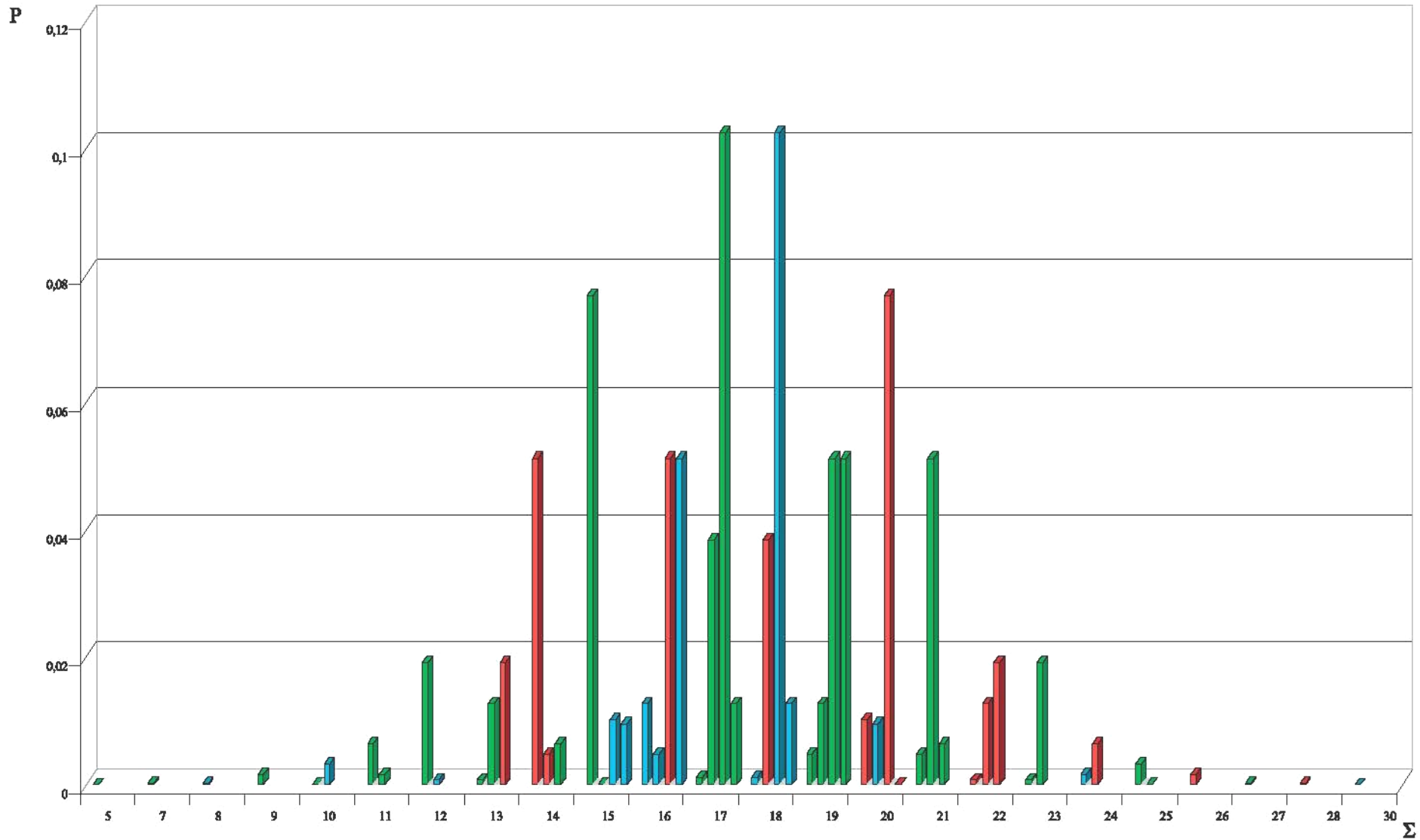
idea of risk linked to **alea** / dice remains the idea of an educated public

Astragal oracles: distribution and the example of Tyriaion



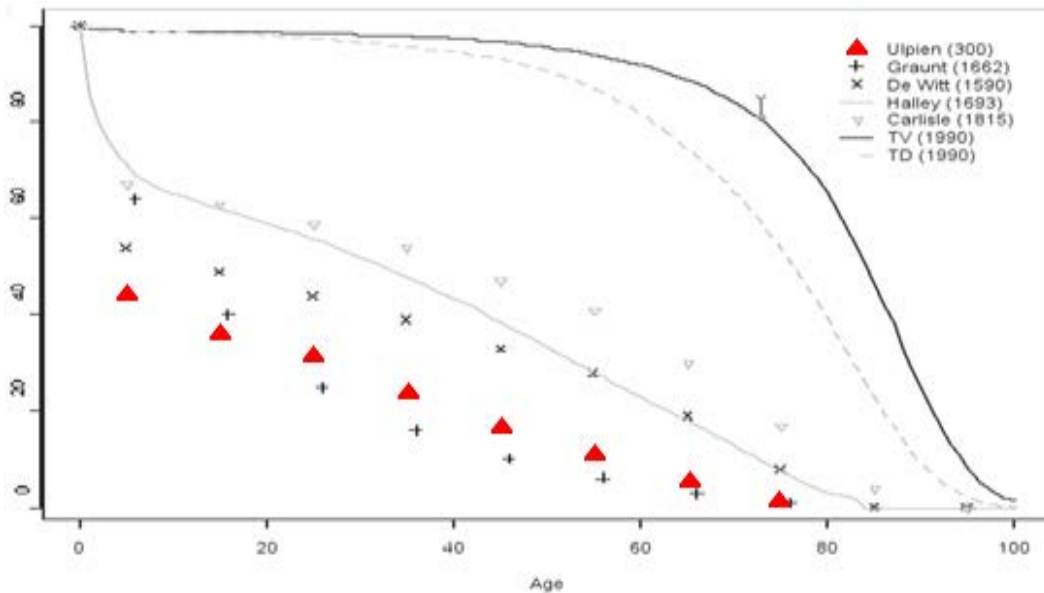
Traduction. "Oracles d'Apollon Pythien à cinq osselets, (donnés) à Hermès. I. 1 + 1 + 1 + 1 + 1 = 5 De Zeus Olympios. Zeus mettra en ton esprit un bon conseil; il donnera la joie à tes affaires, desquelles tu te réjouiras; mais apaise Aphrodite et le fils de Zeus. II. 1 + 1 + 1 + 1 + 3 = 7 D'Athéna Aréia. Echappant à la haine et à la méchanceté, tu arriveras à ton but; tu y arriveras et Athéna la déesse aux yeux brillants te le donnera; il sera selon ton cœur le projet que tu entreprends. III. 1 + 1 + 1 + 1 + 4 = 8 Des Destinées. Cette action que tu accomplis, ne l'accomplis pas; car cela n'est pas pour le mieux; pour qui peine, la situation est difficile et sans issue; il faut aller voir à l'étranger; dans le temps il n'y aura rien de mal. IV. 1 + 1 + 1 + 3 + 3 = 9 De l'Aigle de Zeus. Aigle qui vole haut, à la droite du voyageur, présage de bon augure, avec Zeus Très Grand tu réaliseras l'action dans laquelle tu te lances; ne crains rien. V. 1 + 1 + 1 + 1 + 6 = 10 Du Très Grand Daimôn. La promesse que tu as faite au Daimôn, quelle qu'elle soit, il vaut mieux la tenir si tu veux accomplir ce que tu médites dans ton esprit; Déméter et Zeus te seront des sauveurs. VI. 1 + 1 + 1 + 4 + 3 = 10 De Tychè Protectrice. L'action que tu entreprends à présent, ne l'accomplis pas; étant dans la maladie, les dieux eux-mêmes te sauvegardent, ils mettront fin à ta peine, et rien de mal n'arrivera. VII. 3 + 3 + 3 + 1 + 1 = 11 De la Victoire. Accomplis complètement ton action; car cela sera pour le mieux;

Probability (P) for each of the 56 possible combinations of dots in an oracle where you roll the dice (astragal) five times



Oracle positive Oracle negative Oracle neutral

The life table of Ulpian and later authors



cf: A. Charpentier, *Ajuster les tables de mortalité : le rôle des actuaires*, Risques 72, 2007, 127–130.

Ulpian's life table and the customary life table		
Annuitant's present age (x)	Corresponding figure	
	Ulpian	Customary
0–19	30	30
20–24	28	
25–29	25	
30–34	22	(60-x)
35–39	20	
40–49	(60-x-1)	
50–54	9	
55–59	7	
60–	5	0 (?)
After Frier, "Roman life expectancy", 217, table 1.		

Edict of Ti. Iulius Alexander from the year 68 AD at the Hibis-Temple in Egypt

- lines 5–10 preamble;
- 10–15 the induction of unwilling tax collectors and lease holders;
- 15–26 debts: (1) the cession of debts, (2) the execution of debts upon the person of the debtor, (3) the abuse of *πρωτοπραξία* (the right of first lien upon the possessions of the debtor enjoyed by the fiscus), (4) the seizure of the dowries of foreign women in satisfaction of debts;
- 27–32 exemptions from, and abatements of taxes;
- 32–34 the induction of Alexandrian citizens into liturgies;
- 35 the appointment of *strategi*;
- 36–44 the introduction into the prefect's court of matters already passed upon by previous prefects;
- 44 the emendation of the *gnomon* of the *idiologus*;
- 45–56 new taxes: (1) charged against property within the last five years, (2) based upon the average rise of the Nile for a number of years instead of the current rise;
- 60–61 the measurement of certain ancient tracts of land near Alexandria.



P. Oxy. XXXI 2561

μάτριξ – monthly military list of troop strength and rations (293/305 AD)



SEG 55, 2005, 1264bis

Fragment of a parapegma from Milet (Pergamonmus., Berlin, SK 1606)



for the annual calculation of needs