GORDON
COLLEGE

Mersenne Matters

Mathematics, Music, Monotheism, and More

Karl-Dieter Crisman

Monday, April 21st 2025

Colby College Mathematics Colloquium

Marin Mersenne – more than big primes?

October 12th, new prime number discovered!

$2^{136279841}-1$ = 8816943275…(skip about 41 million digits)…1551

Check out timestamp 6:58 ff!

Marin Mersenne – more than big primes?

Great Internet Mersenne Prime Search

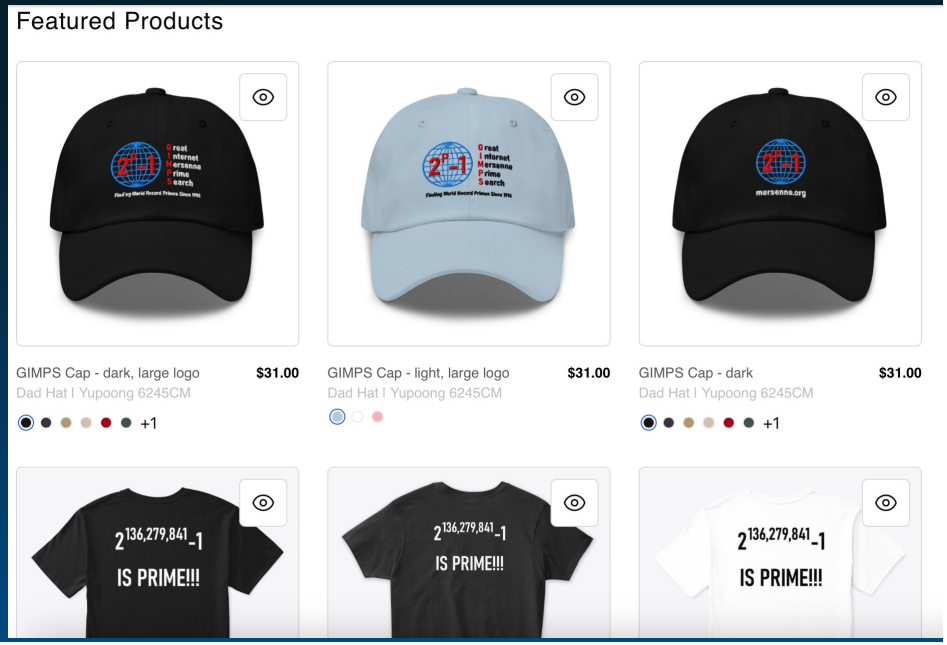
GIMPS

Finding World Record Primes Since 1996

Swag

Want to find a big prime number?

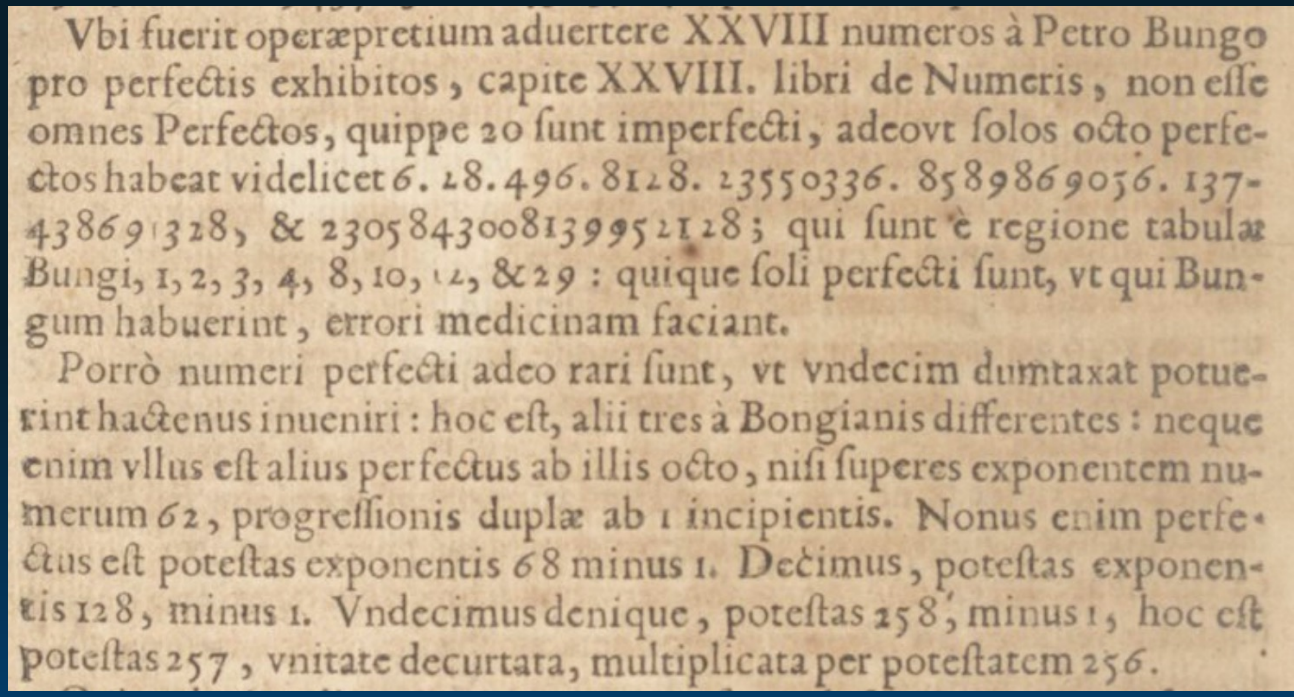
Check out https://www.mersenne.org



Mersenne's Numbers?

Cogitata Physico Mathematica, 1644

2^p-1 prime: Perfection! (67 and 257?)



Vbi fuerit operæpretium aduertere XXVIII numeros à Petro Bungo pro perfectis exhibitos, capite XXVIII. libri de Numeris, non esse omnes Perfectos, quippe 20 sunt imperfecti, adeovt solos octo perfectos habeat videlicet 6. 28. 496. 8128. 33550336. 8589869056. 137-43869 1328, & 2305843008139952128; qui sunt è regione tabulæ Bungi, 1, 2, 3, 4, 8, 10, 12, & 29 : quique soli perfecti sunt, vt qui Bungum habuerint, errori medicinam faciant.

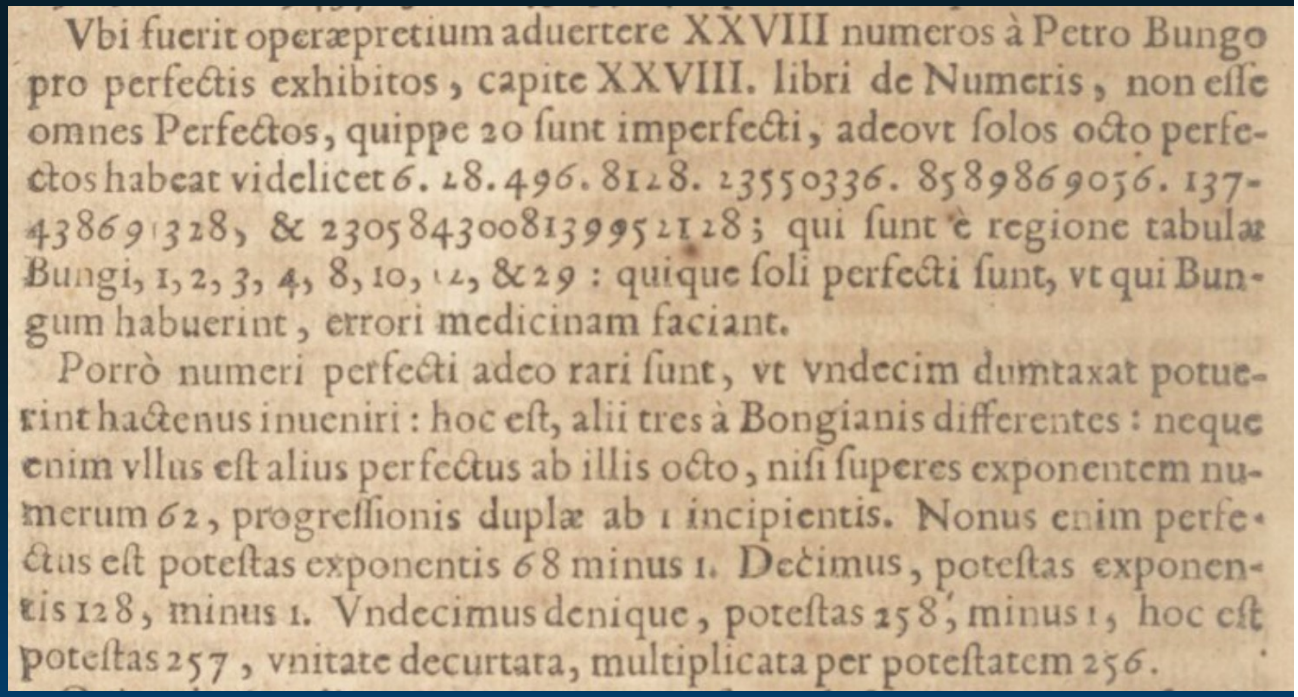
Porrò numeri perfecti adeo rari sunt, vt vndecim dumtaxat potuerint hactenus inueniri : hoc est, alii tres à Bongianis differentes : neque enim vllus est alius perfectus ab illis octo, nisi superes exponentem numerum 62, progressionis duplæ ab 1 incipientis. Nonus enim perfectus est potestas exponentis 68 minus 1. Decimus, potestas exponentis 128, minus 1. Vndecimus denique, potestas 258, minus 1, hoc est potestas 257, vnitate decurtata, multiplicata per potestatem 256.

But who was this author?

Mersenne's Numbers?

Cogitata Physico Mathematica, 1644

Marin Mersenne (1588-1648)



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Is that all there is to him?

Marin Mersenne – many M's

- Minim Monk
- Monotheism
- Mathematics
- Music
- Mechanism
- Modernism
- Messenger (!)
- Mentor
- More?

Main Message: Mersenne Matters

Marin Mersenne – just the facts

Marin Mersenne:

- Born poor (?)
  near Le Mans, France
- Jesuit *college* La Flèche
- *Minim* monk (least of all)
- Religion, science, music
- Traveled some
- Published a lot
- *Helped* publish a lot
- Died of lung abscess

Monotheism

Quaestiones celeberrimae in Genesim

F. MARINI
MERSENNI
ORDINIS MINIMORVM
S. FRANCISCI DE PAVLA
QVÆSTIONES CELEBERRIMÆ
IN GENESIM, CVM ACCVRATA
TEXTVS EXPLICATIONE
IN HOC VOLVMINE ATHEI, ET DEISTÆ
Græcorum, & Hebræorum Musica
FRANCISCI GEORGII
CABALISTICA DOGMATA FVSE REI
OPVS THEOLOGIS, PHILOSOPHI
LVTETIÆ PARISIOR
Sumptibus SEBASTIANI CRAMOISY, viâ Iacob
M. DC. XXIII.

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quæstioni subiectis, præter quas multa problemata præsertim
ad caput 1, & in toto Veneto legere poteris, quæ
ob longitudinem, & excellentiam, quæstionis
vices præstare valeant.

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syllaba *col*, vel litera *c* significat ea, quę ad problemata Veneti notauimus,
& ipsa problemata sępe hoc signo *probl.* designantur, alij numeri, qui soli
sunt absque litera significant ea, quæ dicuntur in indice, reperiri in com-
mentarijs, quos problemata nouis numeris ab vnitate incipientibus distin-
cta sequuntur. Aduerte autem aliquando in indice impiorum, vel aliorum
errores velut affirmatiuè poni, non quod huiusmodi opiniones sequa-
mur, sed vt libentiùs ipsum commentarium consulas, in quo refellitur
error, quod hîc monere volui, ne quorundam instar, statim ipsum indicem
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VERSICVLVS XVIII. ET XIX.

XVIII. Porrò Henoch genuit Irad, & Irad genuit Mauiaël, & Mauiaël genuit Mathusaël, & Mathusaël genuit Lamech.

XIX. Qui accepit duas vxores, nomen vni Ada, & nomen alteri Sella.

וַיִּוָּלֶד לַחֲנוֹךְ אֶת־עִירָד וְעִירָד יָלַד אֶת־מְחוּיָאֵל וּמְחוּיָאֵל יָלַד XVIII.
אֶת־מְתוּשָׁאֵל וּמְתוּשָׁאֵל יָלַד אֶת לָמֶךְ׃

וַיִּקַּח־לוֹ לָמֶךְ שְׁתֵּי נָשִׁים שֵׁם הָאַחַת עָדָה וְשֵׁם הַשֵּׁנִית צִלָּה׃ XIX.

XVIII. Ἐγεννήθη δὲ τῷ Ἐνὼχ γαϊδάδ· καὶ γαϊδὰδ ἐγέννησε τὸν Μαυήλ. καὶ Μαυὴλ ἐγέννησε τὸν Μαθουσαλά. καὶ Μαθουσαλὰ ἐγέννησε τὸν λάμεχ.

XIX. Καὶ ἔλαβεν αὐτῷ λάμεχ δύο γυναῖκας. ὄνομα τῇ μιᾷ, Ἀδά. καὶ ὄνομα τῇ δευτέρᾳ, σίλλα.

RAptim, & veluti perfunctoriè Moses Caini generationem impiam cõmemorat, quòd satis ostenditur Deo ingratam fuisse, nec eorum annos ponit, neque dicit genuisse filios & filias, vt fit in iustorum genealogia, quamuis etiam filias genuerint, & inter illos quidam boni esse potuerint, sicut & in generatione iustorum aliqui improbi. Ex ea verò mentione reproborum summa Dei clementia agnosci debet, qui eos florere facit, vsque adeò, vt bonos opprimãt: vt non deficiamus, si nunc aduersarios patimur, sine quibus nunquam Dei fuit Ecclesia, quæ vel hæreticis, vel tyrãnis, vel hypocritis, & falsis fratribus exercetur. Hebræi dicunt Caïni recenseri genealogiam propter septimam generationem, qua punitus est: alij verò, vt videamus, quomodo primùm filij sæculi huius & peccatorum pœnitentium, vt Lamech: quorum duo genera, 1 & 2 saluantur, 3 perit iuxta id Apoc. 8. *tertia pars terræ, & arborum combusta est.* Apoc 8.

Quare genealogia Caini impij recenseatur?

Henoch igitur genuit Irad וַיִּוָּלֶד *vaiyualed, natus est*: Vbi aduertendum est, יָלַד in *cal* de viris dici, quod sæpe ponitur in Hiphil הוֹלִיד, quod est transitiuum in tertium, ac si diceremus, Irad fecit parere vxorem suam filium, quod fit quando concipit, vt significetur viros esse principium actiuum generationis, quibus ideo verbum *cal* accommodatur, quando de conceptu sermo est, sicut fœminis, quando loquitur Scriptura de partu, quia soli parturiunt. Ex etymo nominum istorum Mauiael, & Mathusaël colligunt Hebræi ante diluuium Noë generale, aliud præcessisse, quod

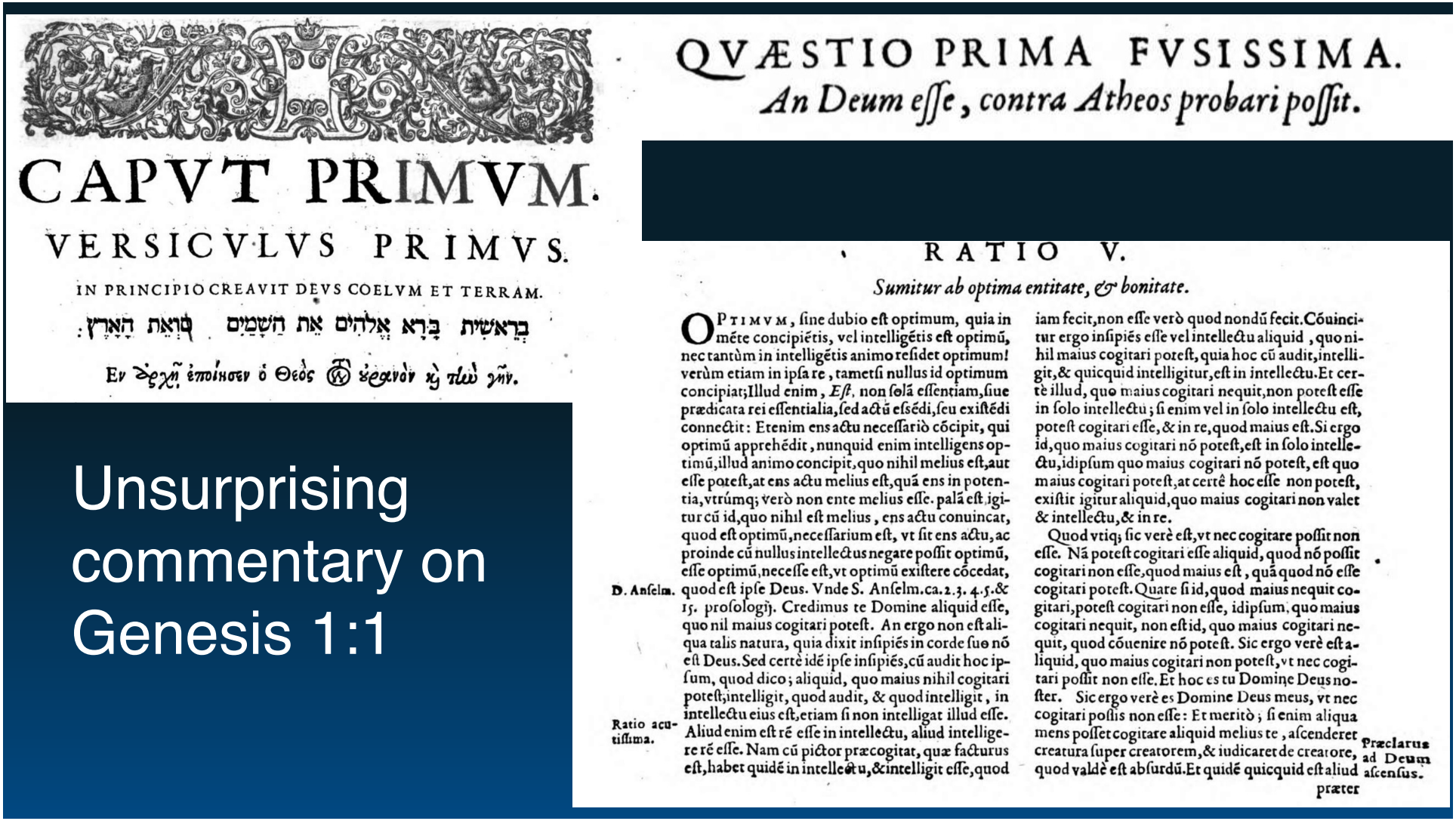
QVÆSTIO LIV.

AN LAMECH PECCAVERIT DVAS VXORES ducendo, & quo iure polygamia prohibita ſit.

HÆc duo inter ſe coniuncta ſunt, vt in idem recidere videantur, enimuero ſi polygamia licita fuerit, non peccauit Lamech, ſin minus, peccatum contraxit, quapropter de polygamia nonnihil dicemus. Scio quidem Lamechum adulterij reum à Nicolao Papa epiſt. ad Lotharium Regẽ appellari c. *an non* 24. q. 3. ſed cùm legis naturæ ſanctos Abraham, & Iacob, ſcriptæ verò Elcana, Dauid &c. polygamos fuiſſe, neq; tamen reprehendi videã, non ita facilè concluſero Lamechũ peccaſſe: nec mihi quis ſine ratione ſuaſerit nullum præter Lamechũ ante magnã eluuionẽ polygamũ fuiſſe: ſi quid enim illud affirmare cogeret, maximè Chriſti ipſius, aut Pontificis authoritas iuuaret: At quãdo ille dixit, *ab initio non fuit ſic*: nõ intelligebat de toto tempore diluuium antecedente, ſed tantùm de ipſa inſtitutione coniugij in paradiſo, vbi cùm Deus vnicam mulierem ex vnica Adami coſta eduxit, ſatis quidem oſtendit ſe monogamiam probare, ſed non inde quis concludere poterat apodictícè polygamiam omnino reprobari: vt igitur liberè dicã quod in eiuſcemodi rebus ſentio, totum negotium duabus propoſitionibus aperio.

Prima propoſitio, certum eſt Monogamiam polygamiæ præponendam, quia id primæ inſtitutioni conformius, at omnium optimè Deus initio res omnes conſtituit; deinde mutua vxoris, & mariti traditio perfectior euadit, dum vnuſquiſque corporis alterutrius poteſtatem habet. 3. mutua obſequia maiori cum amicitia, atque fidelitate redduntur, dum vnus cum vnica contraxit, alioqui vbi ſunt duæ, vel plures fœminæ, contentiones, rixæ, & æmulationes oriuntur, vt patet in Sara, & Agar, Rachel, & Lia &c. de quibus ad c. 21. Gen. dicemus. Denique vix poterit vxorio debito ſatisfacere is, qui plures vxores habuerit.

2. Propoſitio, probabilius mihi videtur nec Lamechũ ideo peccaſſe, quod duas vxores habuerit, nec polygamiam in ſtatu legis naturæ corruptæ etiam ante diluuium prohibitã fuiſſe. His autẽ rationibus ducor: prima, quia non ſunt fingendæ prohibitiones, præcepta, vel peccata, niſi id clarè fuerit expreſſum; nec enim illatio topica ſufficit, cùm non leues coniecturæ in contrarium vrgent, at nihil video, quod aliquid ex prædictis clarè, imo nec obſcurè exprimat. Imo ex Patriarcharum poſt diluuium viuentium exemplo ſatis conijcio id non minus licitum fuiſſe ante diluuium, quia par erat propagandorum indiuiduorum neceſſitas; nec vllam monogamiæ permiſſionem poſt diluuium legimus, ſicut nec antea. Secunda, quia polygamia non repugnat fini primario matrimonij, quin potiùs mirum in modum ei conuenit, nam quo cæteris paribus plures vxores fuerint, eo citiùs homines multiplicantur. Tertia, contentiones, & rixæ optimo totius familiæ regimine vitari poſſunt: adde quòd non deſunt illæ, vbi vnica viuit vxor. Denique nulla Patrum teſtimonia vrgent adeò, quin aliter explicari valeant, vel eorum



CAPVT PRIMVM.

VERSICVLVS PRIMVS.

IN PRINCIPIO CREAVIT DEVS COELVM ET TERRAM.

בְּרֵאשִׁית בָּרָא אֱלֹהִים אֵת הַשָּׁמַיִם וְאֵת הָאָרֶץ׃

Εν ἀρχῇ ἐποίησεν ὁ Θεὸς τὸν οὐρανὸν καὶ τὴν γῆν.

QVÆSTIO PRIMA FVSISSIMA.

An Deum esse, contra Atheos probari possit.

RATIO V.

Sumitur ab optima entitate, & bonitate.

OPTIMVM, sine dubio est optimum, quia in mẽte concipiẽtis, vel intelligẽtis est optimũ, nec tantùm in intelligẽtis animo residet optimum! verùm etiam in ipsa re, tametsi nullus id optimum concipiat; Illud enim, *Est*, non solã essentiam, siue prædicata rei essentialia, sed actũ esẽdi, seu existẽdi connectit: Etenim ens actu necessariò cõcipit, qui optimũ apprehẽdit, nunquid enim intelligens optimũ, illud animo concipit, quo nihil melius est, aut esse potest, at ens actu melius est, quã ens in potentia, vtrúmq; verò non ente melius esse. palã est igitur cũ id, quo nihil est melius, ens actu conuincat, quod est optimũ, necessarium est, vt sit ens actu, ac proinde cũ nullus intellectus negare possit optimũ, esse optimũ, necesse est, vt optimũ existere cõcedat, quod est ipse Deus. Vnde S. Anselm. ca. 2. 3. 4. 5. & 15. prosologij. Credimus te Domine aliquid esse, quo nil maius cogitari potest. An ergo non est aliqua talis natura, quia dixit insipiẽs in corde suo nõ est Deus. Sed certè idẽ ipse insipiẽs, cũ audit hoc ipsum, quod dico; aliquid, quo maius nihil cogitari potest, intelligit, quod audit, & quod intelligit, in intellectu eius est, etiam si non intelligat illud esse. Aliud enim est rẽ esse in intellectu, aliud intelligere rẽ esse. Nam cũ pictor præcogitat, quæ facturus est, habet quidẽ in intellectu, & intelligit esse, quod iam fecit, non esse verò quod nondũ fecit. Cõuincitur ergo insipiẽs esse vel intellectu aliquid, quo nihil maius cogitari potest, quia hoc cũ audit, intelligit, & quicquid intelligitur, est in intellectu. Et certè illud, quo maius cogitari nequit, non potest esse in solo intellectu; si enim vel in solo intellectu est, potest cogitari esse, & in re, quod maius est. Si ergo id, quo maius cogitari nõ potest, est in solo intellectu, idipsum quo maius cogitari nõ potest, est quo maius cogitari potest, at certè hoc esse non potest, existit igitur aliquid, quo maius cogitari non valet & intellectu, & in re.

D. Anselm.

Ratio acutissima.

Quod vtiq; sic verè est, vt nec cogitare possit non esse. Nã potest cogitari esse aliquid, quod nõ possit cogitari non esse, quod maius est, quã quod nõ esse cogitari potest. Quare si id, quod maius nequit cogitari, potest cogitari non esse, idipsum, quo maius cogitari nequit, non est id, quo maius cogitari nequit, quod cõuenire nõ potest. Sic ergo verè est aliquid, quo maius cogitari non potest, vt nec cogitari possit non esse. Et hoc es tu Domine Deus noster. Sic ergo verè es Domine Deus meus, vt nec cogitari possis non esse: Et meritò; si enim aliqua mens posset cogitare aliquid melius te, ascenderet creatura super creatorem, & iudicaret de creatore, quod valdè est absurdũ. Et quidẽ quicquid est aliud præter

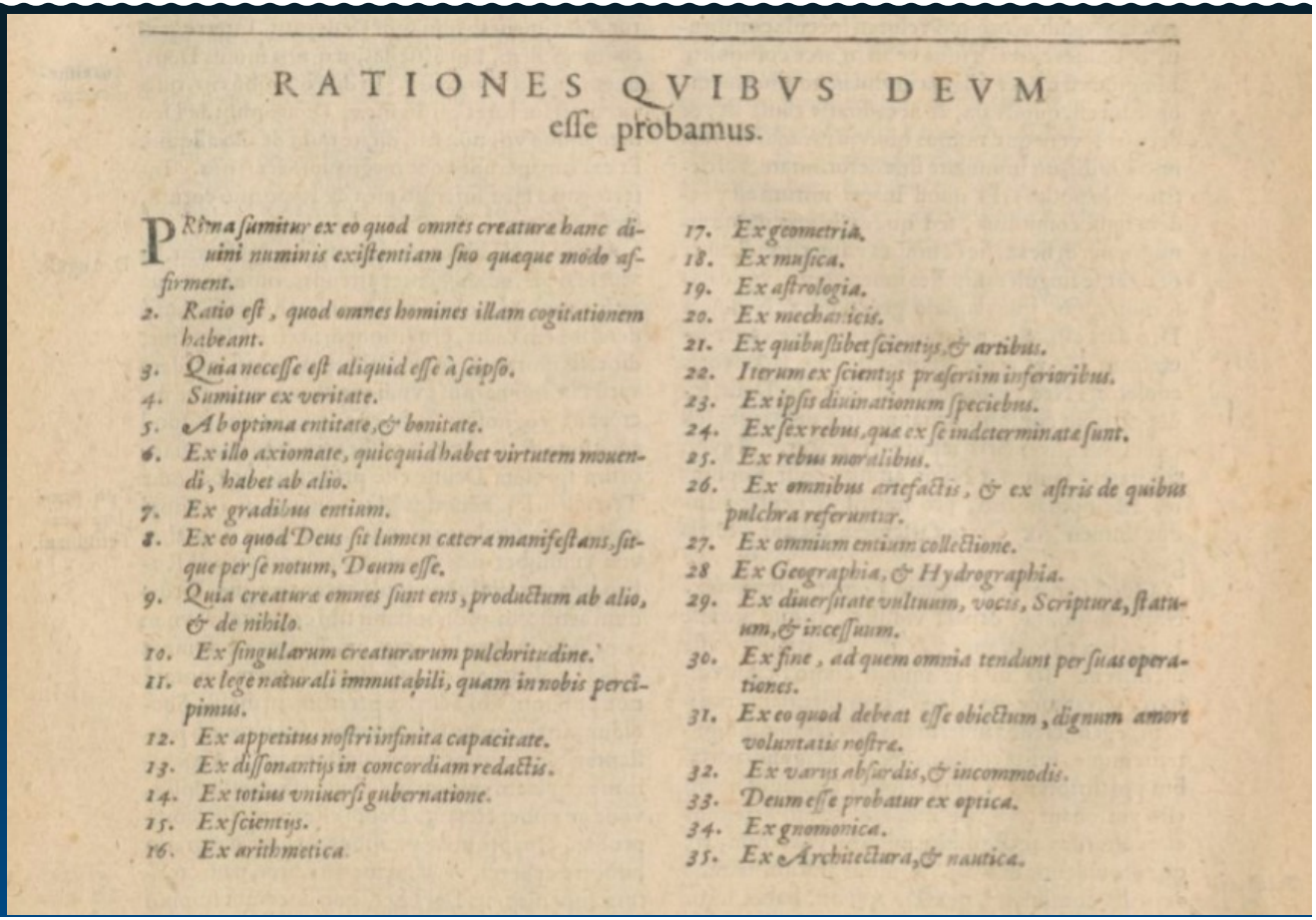
Præclarus ad Deum ascensus.

Unsurprising commentary on Genesis 1:1

Preponderance of Evidence

But maybe this is surprising!

Mathematical liberal arts as part of all learning



RATIONES QVIBVS DEVM esse probamus.

Prima sumitur ex eo quod omnes creaturæ hanc diuini numinis existentiam suo quæque modo affirment.
2. Ratio est, quod omnes homines illam cogitationem habeant.
3. Quia necesse est aliquid esse à seipso.
4. Sumitur ex veritate.
5. Ab optima entitate, & bonitate.
6. Ex illo axiomate, quicquid habet virtutem mouendi, habet ab alio.
7. Ex gradibus entium.
8. Ex eo quod Deus sit lumen cætera manifestans, sitque per se notum, Deum esse.
9. Quia creaturæ omnes sunt ens, productum ab alio, & de nihilo.
10. Ex singularum creaturarum pulchritudine.
11. ex lege naturali immutabili, quam in nobis percipimus.
12. Ex appetitus nostri infinita capacitate.
13. Ex dissonantijs in concordiam redactis.
14. Ex totius vniuersi gubernatione.
15. Ex scientijs.
16. Ex arithmetica.
17. Ex geometria.
18. Ex musica.
19. Ex astrologia.
20. Ex mechanicis.
21. Ex quibuslibet scientijs, & artibus.
22. Iterum ex scientijs præsertim inferioribus.
23. Ex ipsis diuinationum speciebus.
24. Ex sex rebus, quæ ex se indeterminatæ sunt.
25. Ex rebus moralibus.
26. Ex omnibus artefactis, & ex astris de quibus pulchra referuntur.
27. Ex omnium entium collectione.
28 Ex Geographia, & Hydrographia.
29. Ex diuersitate vultuum, vocis, Scripturæ, statuum, & incessuum.
30. Ex fine, ad quem omnia tendunt per suas operationes.
31. Ex eo quod debeat esse obiectum, dignum amore voluntatis nostræ.
32. Ex variis absurdis, & incommodis.
33. Deum esse probatur ex optica.
34. Ex gnomonica.
35. Ex Architectura, & nautica.

MOnas Arithmetica Deum esse facilè persuadet, quandoquidem illa magnam cum Deo similitudinem, atque cognationem habere videtur. numerorum enim omnium finis est, atque principium, vnde nouenarium claudit, in quo quantitatis omnes proprietates, atque species, tam consequentes, & resultantes, quàm primariæ, longitudo latitudo, profunditas, perfectũ, imperfectũ, diuisibile, indiuisible, trigonum, cubus, oblongum, multilaterum, æqualitas, inæqualitas, absolutum, cõparatum, simplex, multiplex, simile, diuersum, sesquitertium, sesquialterum, duplum, triplum, quadruplum, superpartiens, & alia plurima comprehenduntur, quorum omnium principium tam formale, quàm materiale, efficiens, atque finis, vnitas esse videtur; c
nis conficiatu

Nouenarij perfectio.

Excellentia vnitatis.

Quid obsecro admirabilius, quàm vt numerum arenæ maris, imò, & totius terræ recensere possit aliquis? id tamen negotio facillimo facit Arithmetica; quod in illorum philosophorum mentem cadere non poterat, qui Gelonis Siciliæ regis aulam frequentabant; arbitrabantur enim numerum arenę littoribus Syracusanis contentum infinitum esse, vel saltem adeo magnum, vt nullus eum recensere possit, licet per mille annos milliones millionũ continuò proferret. Quos Archimedes à rege rogatus confutauit, atque demonstrauit non solùm inueniri posse numerum arenæ totius, qua globus terrestris constat, verùm etiam numerum illum arenæ, qui in toto mundo tam cœlesti, quàm sublunari esset, si totus mundus quantũcunque minutissimis arenulis coagmentaretur.

Gelõ frater Hieronis.

Sententia Archimedis

RATIO XVI.

Deum esse, Arithmetica suggerit, nec non Algebra cum suo Algorithmo.

Numerus arenæ in toto mundo contentæ per seipsum multiplicandus.

30840979456000000000000000000000000000000000000.
30840979456000000000000000000000000000000000000.

Mirabilis arenæ numerus, qui in aliquo mundo cõtineretur eãdem cum firmamẽto rationem habente, quã firmamentũ cum grano arenæ habet.

Operatio in qua omnia zero 35. quæ characteres sequuntur more solito relinquuntur, vt postea sibi tantùm addantur, sintque 70. in producto subsequente, quod ex hac operatione sequitur.

```
          185045876736
         154204897280
        123363917824
       277668916104
      215886856192
     277668916104
    00000000000
   123363917864
  246727835648
 00000000000
92522938368
```

Numerus inde productus arenam à supposito mundo contentam exhibens.

95143798134919055936000000000000000000000000000000000000000000000
0000000000000000000000000 00000000.

Hunc autem numerum quis sine maximo tædio, & eorumdem verborum battologia efferet? modum tamen omnium facillimum suggero, quo & hunc, & quemlibet alium numerum maiorem, & maiorem in infinitum explicare possimus; primò quidem vsque ad centum milliones pro more numerabimus in loco nono, in decimo verò, & in vlterioribus locis ordine retrogrado quædam vocabula, noua quidẽ, sed optimè rem totam cõficientia vsurpabimus; itaque loco decimo licet mille milliones, in vndecimo decadem millium millionum, in duodecimo centum mille milliones, in decimotertio millionem millionum, in 14. decadem millionum millionum, in 15. centum milliones millionum, in 16. mille milliones millionum, in 17. decadem millium millionum millionum, in 18. centum millia millionum millionum, in 19. millionem millionum millionum, & sic deinceps decem milliones millionum millionum, centum milliones, mille, decẽ millia, & ita deinceps efferre possemus, breui tot millionum & millionũ nobis pronuntiandum erit, vt id non tantùm fastidium, & nauseam pariat, sed etiam turbet imaginationem.

Modus vulgaris numerandi quis sit, & cur hic contẽnitur.

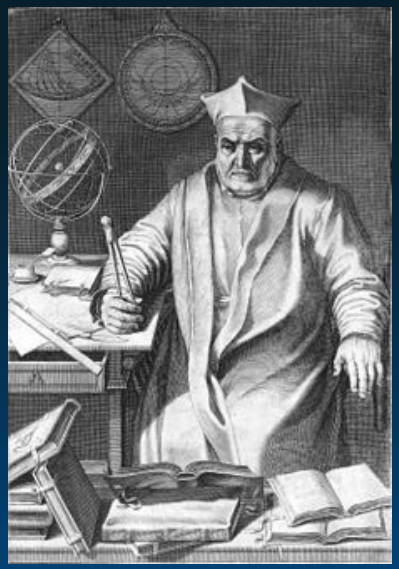
Itaque loco octauo bilionem dicemus, quod decem milliones valebit, in 9. decem biliones, in 11. centum biliones, nec vlterius illa voce vtemur; sed terno quoque charactere nomen cum numero sequente mutabimus, tum vt frequens eiusdem vocis, & ingrata repetitio vitetur, tum vt omnibus characteribus tertio quoque ordine notatis, sciamus quænam vox efferenda sit, itaque super characterem, qui bilionem designat, estque loco decimo, binarium notabo, ternarium super trilionem, & sic de cæteris, vt patet hîc.

Nouus & facilis numerandi modus.

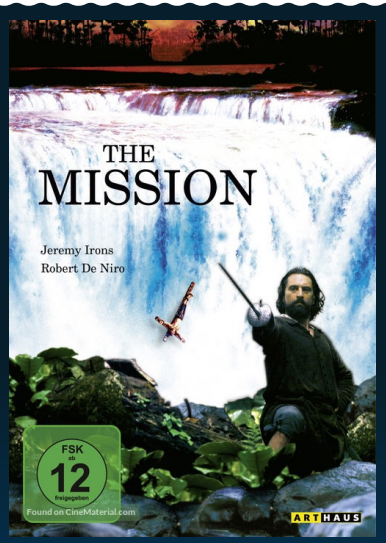
29 28 27 26 25 24 23 22 21 20 19
95143798134919055936000000000000
18 17 16 15 14 13 12 11 10 9
000000000000000000000000000000
8 7 6 5 4 3 2
0000000000000000000000000000.

Mathematics – why?

Clavius' calendrical reform:
10/4/1582 - 10/15/1582 !



Euclid studied in Jesuit *colleges* as order, reason



To Mersenne, shows possibility of grounded belief, against those who say there is no truth

Music

Acoustics and Music

- *Traité de l'Harmonie Universelle (1627)* and *Harmonie Universelle (1636-7)* are his best known works overall
- Mersenne's greatest intellectual firsts:
  - First published law on vibrating string
  - Wind instrument sound as physics/math

RE qui ſuit en debouchant le ſixieſme trou, & ainſi des autres iuſques au 19. ſon, qui ſe fait en ouurant ſeulement le troiſieſme trou, car elle a vne Dix-neufieſme d'eſtenduë, comme l'on void par les notes de la Muſique.

Tablature & Eſtenduë de la Fluſte d'Allemand.

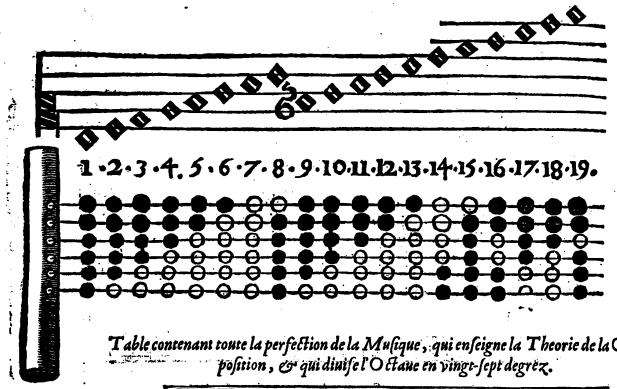
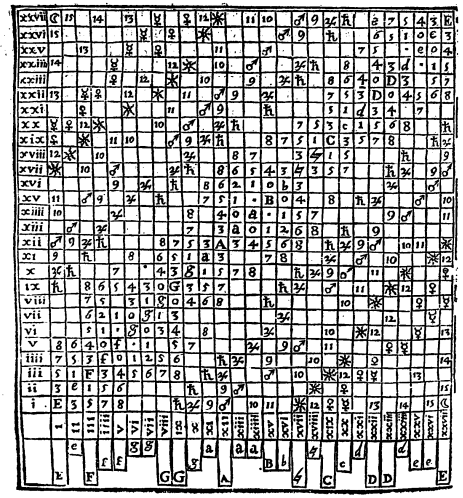


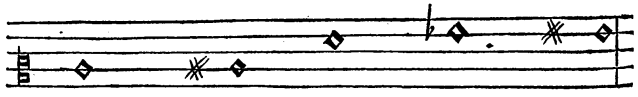
Table contenant toute la perfection de la Muſique, qui enſeigne la Theorie de la Compoſition, & qui diuiſe l'Octaue en vingt-ſept degrez.



Metaux	Poids des chordes.	Sons des chordes.
Or fin.	24. grains, & $\frac{3}{8}$	100 $\frac{1}{5}$
Or de trauail ou meſlé.	23. grains $\frac{15}{16}$	98
Argent fin.	15. grains $\frac{1}{8}$	76 $\frac{1}{2}$
Argent de trauail.	15. grains $\frac{1}{16}$	76 $\frac{1}{2}$
Cuiure franc, ou rouge.	12. grains $\frac{5}{8}$	69
Cuiure iaune, airain ou leton.	12. grains $\frac{1}{12}$	69
Fer.	9. grains $\frac{8}{15}$	66

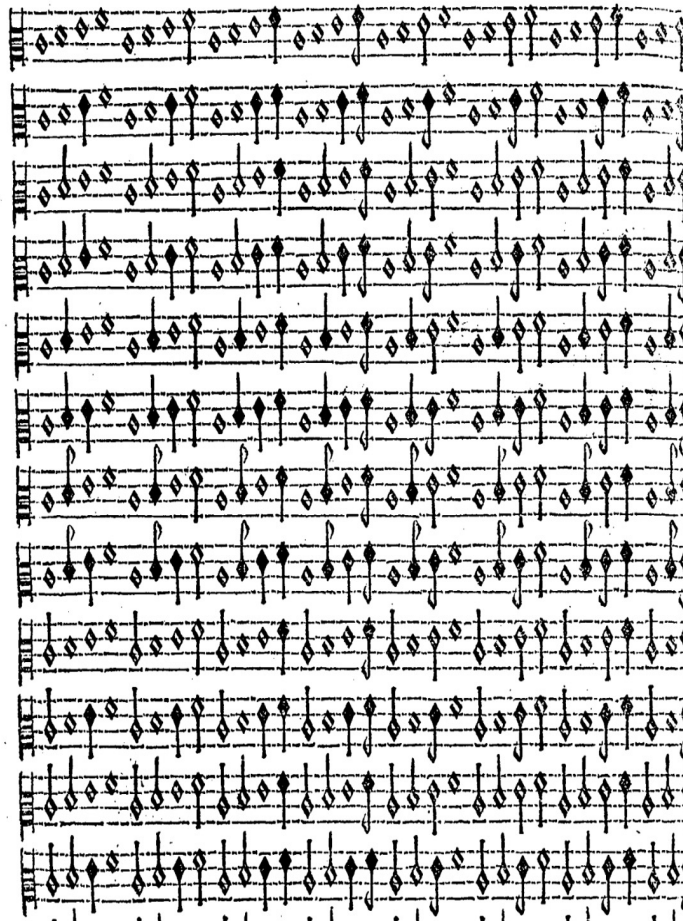
Or il faut remarquer que les plus grands nombres ſignifient les ſons plus ſourds ou plus graues, & les moindres les plus aigus: & qu'il eſt tres-facile de ſçauoir quelles conſonances ou diſſonances ſont tous ces metaux les vns auec les autres, car puis que l'on void les nombres qui repreſentent leurs ſons, il faut ſeulement conſiderer la raiſon de ces nombres.

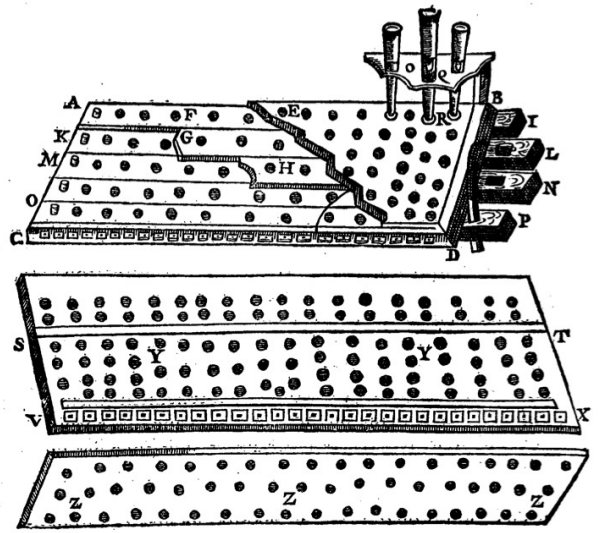
Quant au iugement de l'oreille, la chorde d'or fait la Quinte forte auec la chorde de fer: auec lequel l'or meſlé fait la Quinte foible. L'argent fait le ton maieur auec le fer, auec lequel le cuiure fait le ſemiton maieur: l'argent auec le cuiure fait le ton mineur. L'or fin fait la Quinte diminuée auec le cuiure, qui fait le Triton auec l'or meſlé. Finalement l'or fin fait la Quarte iuſte auec l'argent, & la diminuée auec l'or meſlé: mais ſi l'on veut trouuer ces comparaiſons plus iuſtement que par l'oreille, il ſe faut ſeruir des nombres qui ont tous eſté marquez par le moyen de l'vniſſon; ce que les Practiciens comprendront plus ayſément par les notes qui ſuiuent, & qui monſtrent le ſon de chaque chorde du metal, dont le nom eſt deſſouz.



Or fin. Or de trauail. Argent fin & de trauail. Cuiure & leton. Fer.

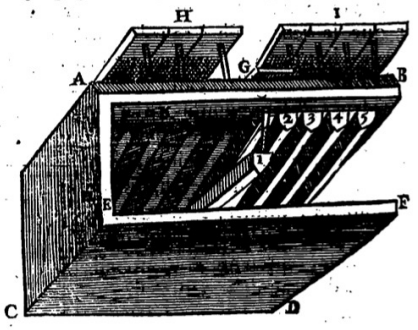
Table des 256 Varietez de quatre temps differens.





que le vent ne ſe puiſſe communiquer de l'vne à l'autre, de peur qu'il ſe face des emprunts, qui font ſouuent corner les tuyaux qui ne doiuent pas ſonner.

Apres que le velin a eſté collé, il faut le couper ſur les reineures pour les deſcouurir de la longueur des ſoupapes, qui ſont de petits morceaux de bois marquez en cette troiſieſme figure par 1,2,3,4 & 5: & parce qu'ils doiuent couurir parfaitement l'ouuerture des reineures T Y, elles ſont vn peu plus larges, & ſont doublées de cuir de mouton pour empeſcher que le vent ne ſe perde. La queuë de chaque ſoupape eſt attachée au ſommier vers l'Y de la premiere figure, auec vn



Mathematics as harmonious

Look for the 3-perfect numbers!

Later we have "amicable" pairs 284,220 and 18416,17296 via Fermat.

XIII. Obſeruation.

Des parties aliquotes, de 120, & des nombres amiables.

IL faut ajoûter à ce que j'ay dit des parties aliquotes des nombres dans la dixiéme remarque de la premiere Preface generale, la methode de trouuer le nombre ſemblable à 120, dõt ie parle au lieu ſuſdit. Il faut donc mettre tant de nombres de ſuite qu'on voudra en raiſon double, en commençant par 2, comme ſont les nombres A, B, C, D, E, F, deſquels l'vnité eſtant oſtée, l'on face les nombres G, H, I, K, L, M, & auſquels l'vnité eſtant ajoûtée l'on face les autres nombres N, O, P, Q, R, S.

G, H, I, K, L, M.	A, B, C, D, E, F.	N, O, P, Q, R, S.
1, 3, 7, 15, 31, 63,	2, 4, 8, 16, 32, 64,	3, 5, 9, 17, 33, 65.

Lors que l'vn des nombres G, H, I, K, L, M, par exemple, K, diuiſé par le nombre N, du dernier ordre éloigné de 4 rangs à main gauche, produira vn nombre premier, le triple de ce nombre premier multiplié par le nombre du rang du milieu, qui precede K immediatement, donnera le nombre requis: comme l'on void en 15 diuiſé par 3, d'où vient 5 nombre premier, dont le triple 15 multiplié par 8, fait 120, qui eſt le nombre que nous auons donné dans la Preface ſuſdite.

L'autre exemple ſe void en 63, lequel diuiſé par 9, produit le nombre premier 7, dont le triple 21 multiplié par 32, fait 672, qui eſt l'autre nõbre requis.

Messenger (and sometimes Mentor)

Starting in the mid-1620s with less familiar figures, he ended up corresponding for decades with, among others:

- E. Pascal
- Galileo
- Torricelli
- Hobbes
- Comenius
- Fermat
- Most famously, Descartes, whom he peppered with annoying questions …

On topics from organ registration, to nature of philosophy, to free fall in physics, to numbers, to the vacuum, to the cycloid, to translation, to tangents ...

Messenger (and sometimes Mentor)

Also:

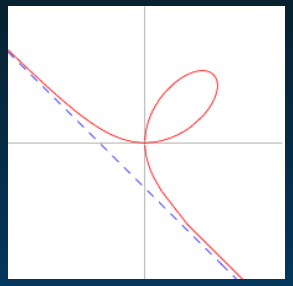
- Young B. Pascal
- Young Ch. Huygens

(Small skills, Big network? Maybe for math – e.g., Mersenne likely only *communicated* "his" primes. But a good experimentalist.)

Messenger – Scientific Internet of 1600s

‘Pre-Calculus’ via Mersenne’s ‘salon’ in his cell:

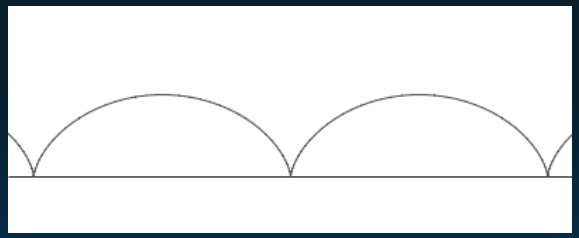
- Hobbes
- Roberval
- Descartes
- Fermat



(Essential with Descartes and Fermat, but sometimes overshared!)

Messenger – Scientific Internet of 1600s

In 1628, Mersenne posed the challenge of the *roulette*, or *cycloid,* to others.



Descartes to Roberval about area result: "a pretty one … which would cause no difficulty to any moderately skilled geometer."

An Imperfect Messenger

Galileo:

Around a year ago I received a writing of a Father Mersenne of the Minims of St. Francesco di Paola sent to me from Paris, but written in such characters that all of the Accademia of Florence were unable to understand it, to such an extent that no construct could be derived from it […] I answered the friend who sent it to me that he should let that Father know that he should write to me in more intelligible handwriting.

Mechanism and Modernity

Mersenne and Copernicanism:

- Rejects Galileo's interpetation in *Quaestiones*
- Finds "more probable" in later work, but never fully commits

Why?

- Not so much theology - "[Mersenne] admits … if proof [is] forthcoming … the Church will be wise enough to deal with the problem"
- Rather: Proofs not convincing scientifically!

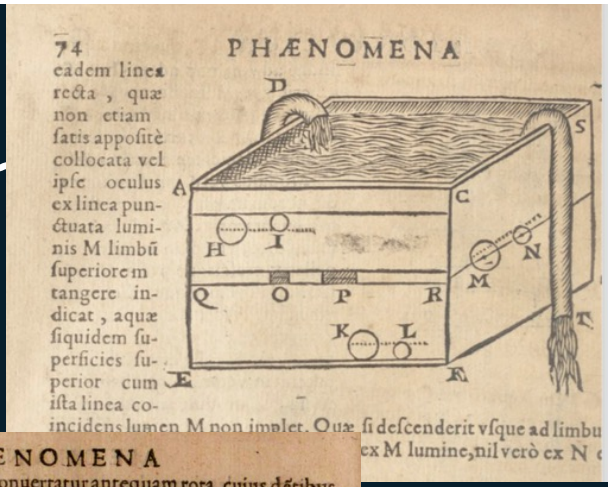
Mechanism and Modernity

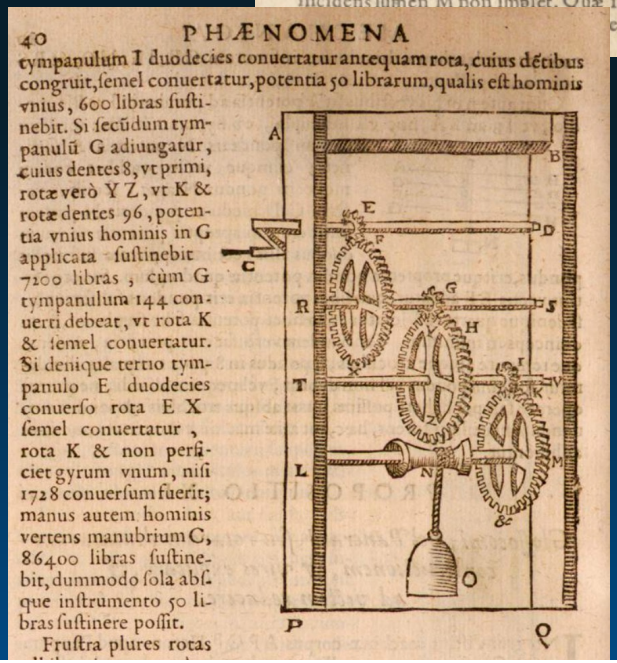
Introducing mathematics into philosophical physics:

- Mersenne and Descartes: *physico-mathematics*.
- Not Bacon's *mixed* mathematics
- Need data *and* phil. reasoning

Intellectual historians:

- Mersenne promotes experimentally verifiable *mechanisms* (Lenoble)
- Possibly even modern in an identifiable sense, as slowly moves away from Aristotle



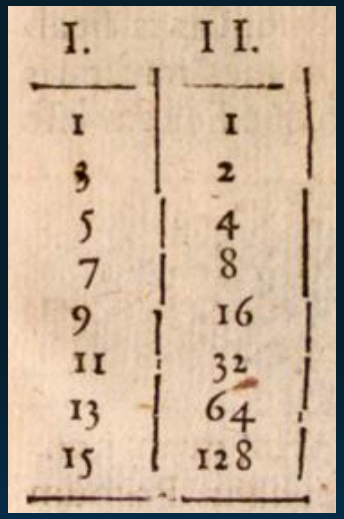


Mechanism and Modernity

In fact, Mersenne was eager to help Galileo publish, and even published his own versions (not just translations) in France!

Another example: Galileo's odd-number free fall law (now derived from calculus) not only didn't always fit experiment, but "[he] compared Galileo’s law of free fall with [another] and pointed out that for short distances, the difference between the two was so small as to defy experimental verification."

Mechanism and Modernity



I.	II.
1	1
3	2
5	4
7	8
9	16
11	32
13	64
15	128

Sur le plan incliné de vingtcinq degrez le boulet tombe vn pied & demi, il deuroit tomber deux pieds, vn pouce ⅓: ſur celuy de trente degrez il tombe deux pieds: il deuroit tomber deux pieds & ⅓, car il feroit ſix pieds dans l'air, tandis qu'il tombe deux pieds & ⅓ ſur le plan, au lieu qu'il ne deuroit tomber que cinq pieds. Sur le plan incliné de 40 degrez, il deuroit tomber trois pieds, deux pouces ⅓: & l'experience tres-exacte ne donne que deux pieds, neuf pouces, car

COROLLAIRE I.

Ie doute que le ſieur Galilee ayt fait les experiences des cheutes ſur le plan, puis qu'il n'en parle nullement, & que la proportion qui donne contredit ſouuent l'experience: & deſire que pluſieurs eſprouuent la meſme choſe ſur des

Mersenne was about careful experimentation as well as extrapolation from first principles.

More and more on Mersenne

More:

- Travels to the north
- Travels to the south
- Barometric pressure at end of life

After Quaestiones, his friend Gassendi helped him find a less polemical voice, but his main goal was still exploring the natural world to glorify God (and confound His deniers).

Mersenne Matters

- *Broad-minded* while being *Goal-Oriented*
  - Investigated *everything* interesting, not a narrow specialist
  - Would *purposefully communicate* despite disagreements
- *Synthesizing*
  - *Compiled* and *promoted*, not focused on originality
  - *Recreated* experiments and corroborated others' work
- *Tactical*
  - Sought to reach *broad audience*
  - *Mentored* younger researchers at some length
- *Humble*
  - *Life-long learner* unashamed to ask dumb questions
  - *Little regard to priority* or fame

Mersenne is a challenge to academic culture.

Acknowledgments

Many people made this presentation happen.
Thank you to:

- Eric Friedlander and Maggie Kemper, for long ago introducing me to Mersenne
- Colleagues at Gordon and elsewhere for encouragement
- Profs. Gouvêa and Dodson for the invitation
- You for coming!

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Epilogue: Mersenne and Me

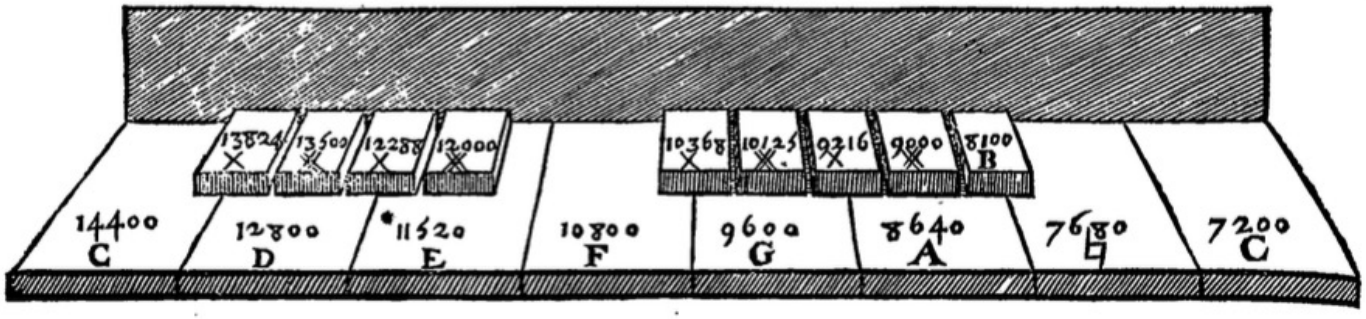
Mid-90's:

- French organ literature class
- Due to "Mersenne".
- Wait, that couldn't be the same guy – could it?

TABLE DES IEVX DE L'ORGVE.

	Ieux simples.	Ieux composez.	
A	Monſtre de 16 pieds, d'eſtain fin.	Plain-ieu.	A, B, C, D, E, F, G & K.
B	Bourdon de huict pieds bouché, ou de 16 pieds ouuert, de bois.	Ieu Muſical.	C, D, E. D, E.
C	Huit pieds ouuert moitié bois, moitié eſtain.	Doublette.	D, F.
D	Bourdon de 4 pieds bouché, de bois.	Gros Bourdon.	B, E. B, C, E.
E	Le Preſtant, ou le 4 pieds ouuert, d'eſtain.		
F	Doublette, les pieds de plomb, & le corps d'eſtain.	Gros Cornet.	D, K, L. B, I. B, E, K.
G	Fourniture, de meſme matiere; elle recommence d'Octaue en Octaue, & a 5, 6, 7, 8, ou 9 tuyaux ſur chaque marche, & eſt d'vn pied ouuert.	Cymbale.	D, H. H, L, M. D, L, M, N.
H	Cymbale, de meſme, & a 3 pouces d'eſtain.	Nazard.	D, L. D, L, N. L, MN.
I	Flageollet d'vn pied & demy.	Flageollet.	D, O. D, L, O.
K	Tierce, de meſme.	Cornet.	D, E, L, P. D, E, P.
L	Nazart à cheminée, ou en fuſeau.	Trompette & Cleron.	D, E, G. E, G. D, E, G, R.
M	Fluſte de deux pieds bouché d'eſtain à cheminée.	Cleron.	B, [illegible] L, M, R. D, R.
N	Fluſte douce, ou à neuf trous d'vn pied.		
O	Flageollet d'vn pied.		
P	Cornet à cinq tuyaux d'vn pied.		
Q	Trompette d'eſtain de huit pieds.		
R	Cleron d'eſtain de quatre pieds.		

chaque interualle conſonant ou diſſonant, comme l'on void dans ce troiſieſme Clauier qui a dix-ſept touches, afin de contenir les Feintes des deux pre-



cedens : mais parce que tous ne ſçauent pas comme il faut trouuer les raiſons de ces nombres, ie les explique icy ſi clairement qu'il n'eſt pas quaſi poſſible qu'on ne les entende.

C ſol vt fa	7200
Semiton mineur	
♯ mi	7680
demiton moyen	
B fa	8100
demiton maieur	
A mi la re	8640
demiton mineur	
x a	9000
dieſe	

Car l'on void les interualles, qui ſont entre chaque note, ou diction, & conſequemment les touches, qui font les Conſonances, ou les Diſſonances dans leur iuſteſſe : ce que i'explique encore dans la table qui ſuit, & qui commence par le C ſol vt fa d'enbas.

Vſage du Clauier, ou de l'Octaue qui a 17. marches.

De C | De F


CLAVEM VSICVM
ADOCTA MANV TACTVM
INSIGNE
VITO DE TRASVNTINIS VENETO AVCTORE