

ing it again, was found to have lost one dram, 6 grains.
 Dec. 3, Mr. *Arthur Bayly*, one of the *Fellows* of the *R. Society*, presented them with a piece of this *Linnen* in the name of Mr. *Waite*. At the same time, the same Mr. *Bayly* presented Dr. *Plot* with another piece of it, which being brought to *Oxford* the *Experiment* was again repeated on it (Dec. 16.) it being put into a strong *Charcoal fire* in the *Natural History School*, in a full meeting of the *Philosophical Society* of that *University*; where after it had continued red hot for some considerable time, it was taken forth again little altered when cold, saving that it seemed a little *whiter* and *cleaner* than before it was put in; as appears upon the *Journal* of that *Society*. Concerning which, Dr. *Plot*, being desired to offer his thoughts, drew up the following *Discours*, which was read before the said *Society*, *June* the 23^d *An.* 1685.

A Discourse concerning the Incombustible Cloth above mentioned; Address't in a Letter to Mr. Arthur Bayly Merchant, and Fellow of the R. Society; and to Mr. Nicholas Waite, Merchant of London; by Rob. Plot. LL. D.

Worthy Gentlemen.

THE Historical account of the *incombustible Linnen Cloth* above mention'd, being sent me by the one of You; and a noble present made me of part of it by the other; with a desire from both, that I would search the old *Authors* and see how agreeable their *relations* are to this; give you Both a just right to the following *Discourse*: which I desire you would believe I address to you, not so much out of *Complement*, as true *gratitude* for so valuable

K k 3

a

a gift. It being esteemed by the *Ancients*, though then more common, and perhaps better known, than 'tis yet amongst us, equally pretious with the best of Pearls^a.

Nor is it now of mean value even in the *Country* where made, a *China Cove*t, (i. e. a piece 23 inches and $\frac{3}{4}$ long,) being worth 80 *Tale* i. e. 36^{lb}. 13^s. 4^d. But that which much enhanced its worth with me, was, that hereby you put me in a capacity of giving full satisfaction to this famous *University* of the reality of the thing; whereof, I cannot blame them, if some did doubt; since we find very good *Authors* to have done the same: who though they owned such a mineral as *Amiantus*, out of the woolly part whereof this sort of *Linnen* was always anciently said to be made, yet questioned the possibility of its having been actually done: *Dalecampius* holding it very incredible, that it should be *woven* into *cloth*, by reason of its *brevity*^b; and *Schildius* in his *Commentary* upon *Suetonius* absolutely denying it, *Multi falso sibi Linteum quoddam dicitur ex ingenio suo comminiscuntur*, being his very words^c. *Xuerius Boxhornius* does not indeed deny but that there might be such *Linnen* amongst the *Indians*, where the *materials* of it grow; of which they might make them *funeral shrouds* wherein to enwrap the bodys of their *Princes* (as they say the ancient manner was) and so preserve their *Asbes* distinct from those of the *Pyra* in which they were burnt: but he is peremptory that the *Romans* never used any such^d; and so is *Isaac Casaubon*^e. The truth whereof I shall not dispute: but whether they did or no, I am sure they might, had they pleased; for *Pliny* says expressly (and I dare believe him in any thing he speaks of his own knowledg) that he himself had seen *Napkins* thereof, which being taken *foul* from the board at a great feast, were cast into the *fire*, by which means they were better *scoured*, and looked *fairer* and *cleaner*, than

^a C. Plinii 2^o Nat. Hist. Lib. 19. c. 1. ^b Jac. Dalecampii notæ in locum supra citat. ^c Joh. Schildij notæ in C. Suet. Tranq. Lib. 2. ^d M. Xuerii Boxhornii Quest. Rom. Quest. 25. ^e It. Casaub notæ in Sect. Lib. 2. p. 186.

if they had been wash't in *water*^l. Now if they had such *Napkins*, they might no question have had *Sheets* of it too, and put them to the use above mention'd had they thought it expedient, as, 'tis said in the *Letter* above, the *Tartarian Princes*, and others adjoining, doe at this very day.

That this *Linnen* was very well known to the *Ancients*, beside that of *Pliny*, we have the further testimony of *Cælius Rhodiginus*, who agrees with the *Letter*, placing both the *materials* and *manufacture* of it in *India*^s; and *Paulus Venetus* more particularly in *Tartary*, the *Emperour* whereof, he says, sent a piece of it to Pope *Alexander*^h. It is also mention'd by *Varro*; and *Turnebus* in his *Commentary* upon him, *de Lingua Lat*ⁱ. And by all of them as a thing inconsumable by fire. In these latter ages: *Geo. Agricola* tells us, that there was a *Mantle* of this *Linnen* at *Vereburg* in *Saxony*^k; and *Simon Majolus* says, he saw another of it at *Lovain* expos'd to the fire^l. *Salmuth* also acquaints us that one *Podocattarus* a *Cyprian* Knight shewed it publickly at *Venice*, throwing it into the *fire* without scruple or hurt^m; and Mr. *Lassells* saw a piece of it in the curious *Cabinet* of *Manfred Septalla*, Canon of *Milan*ⁿ. Mr. *Ray* was shewed a purse of it by the Prince *Palatin* at *Heidleberg*, which he saw put into a pan of burning *Charcoal* till it was throughly ignite, which when taken out and cool, he could not perceive had receiv'd any harm^o; and we are told in the *Burgundian Philosophy*, of a long *Rope* of it, sent from *Signior Boccioni* to the *French King* & kept by Monsieur *Marchand* in the Kings gardens at *Paris*, which though steeped in *oyle* & put in the *fire*, is not consumed^p. To which add, that we have now seen a piece of this *Linnen*, pass the fiery triall both at

^l C. Plinii 2^{di}. Lib. 19 cap. 1 & Cæli Rhodigini Lectionum Antiq. Lib. 18. cap. 31. b. M. Facili Veneti de Regionibus Orientalib. Lib. 1. cap. 47. i Andr. Turnebi Comment. in Varr. de Lingua Lat. k Geo. Agricola de natura Fossilium Lib. 5. l Sim. Maioli dierum Canical. part. 2. colloq 20. m Hen Salmuth in Pancirolli rer. deperdit. Tit. 4. n Rich. Lassells Voyage into Italy Part. 1. o Ray's Observat. Topograph. &c. pap. 83. p Philosoph. Burgund. Tom. 5. Tract. 5. cap. 5.

London, & Oxford. So that it seems to have been known in all ages, all describing it after the same manner, as a thing so insuperable by *fire*, that it only *cleanses* and makes it better.

It being clear then beyond controversy, that there always was, and now is such *incombustible Linnen*; it cannot but be worth while to consider it nicely, and in its full extent, which I shall doe first in giving some account of the notation of the *Names* of the *lanuginous mineral* of which 'tis made, and the *places* where found. 2. of its *natural principles*. 3. of the *manufacture* of it into *thread cloth*, &c. 4. of the *variety of uses* it has been put to. and 5. of the *reason* why *incombustible*. And of all these with as much brevity, as perspicuity will admit of. First then as to the *notation* of its *Names* whereof it has many, taken from its *qualities, colour, texture, and places* where found; It is called first (from its strange *qualities*) sometimes *Amiantus, quod in ignem injectus non uritur*, the *fire* being so far from *defiling* it, that it rather gives it a *lustre*. 2. It is call'd *Asbestos*. and 3. *Salamandra*, in English *Salamanders wool*; I suppose from the *thryallides* or *Candle-Wicks* said to be anciently made of it, which being put into *Lamps* of such *inconsumable oyl*, as is mention'd in the *Letter*, would never waft, or goe out; which I take to be the true reason of the imposition of these *Names* upon it, whether there ever were any such *Lamps* or noe. For as for the stone *Asbestos* or *Apfytos* mention'd by *Solinus*⁹, *Isodore*^r, *Salmasius*^t, and *Maiolus*^t, found in *Arcadia* of an *Iron-colour*, which they all say if once *heated*, can never be *extinguish't* or *cooled* again; it must be a quite different thing from *ours*, then which nothing is *extinguish't*, or *cooled* sooner. Nay so far is it from being the same with our *Asbestos*, that

⁹ Julii Solini Polyhist. Cap. 12. r Isodor Episc. Hispal. Orig. Lib. 16. Cap. 4. f Cl. Silvanii Exercitat. Plin. in C. Jul. Solini Polyhist. t Sim. Maioli Colloq. Phys. admirand. Colloq. 18. & 22.

strictly speaking, I dare boldly say, there was never any such thing in *nature*: Notwithstanding what *Metaphrastes* tells us of it, relating to St. *George* the *Megalo-Martyr*, *Patron* of the *English*; who being condemned to be burnt by his wicked persecutors, that had seen many miracles done in the name of *Christ*, fearing the virtue of that *Name* might extinguish the common fire, *Asbesto lapide Sanctum obruerunt*, cover'd him all over with *Asbestos* stones which they thought could never be extinguish'd^u, For I guess with *Bollandus* it was nothing else but *Calx viva*^w; or *unslaked Lime*, which kept dry will indeed retain its fiery particles for a long season; or else some such stone as the *Afydos* of *Pliny* which once heated will hold so for a week^x; like the *Ruggiola's* of *Spain* (which are broad plates, like tiles, cut out of a Mountain of red Salt near *Cardona*) that being heated on both sides will keep warm for a whole natural day^y; or our *Cornish* warming stone which will hold heat for 8 or 10 hours; All, or any of which, *per Synecdochen partis*, may in some sense be call'd *Asbestos* well enough. Yet *Isodore* and *Maiolus* both tell us of a *Lamp* that hung somewhere in a *Temple* of *Venus*, that had a wick of such *Asbestos*, that no tempest either of wind or water could possibly extinguish^z; and we are told that the *Lamp* found in the tomb of *Pallas* the *Arcadian* slain by *Turnus* in the *Trojan* War, was of this kind, it remaining burning after it was taken forth, notwithstanding either *wind* or *water*, with which some did endeavour to quench it^a. Which *Histories* must either be false, or the *Lamps* must have *Wicks* of some different kind of *Asbestos* from ours; which is easily extinguish'd; and from a pungent quality *Agricola* says it has on the tongue without *astringency*, is otherwise call'd *Alumen*^b, having the distinguishing Epithet [*plumeum*]

^u Sim. Metaphrastes in Encomio Sti. Georgii apud Lipoman. Tom. 7. in Apr. 23. ^w Bollandus in Acta Sanctorum. Apr. 23. 2. ^x C. Plinii 2^o. Nat. Hist. Lib. 37. cap. 10. ^y Fr. willoughby's Voyage through Spain. p. 471. ^z Isidor. Episc. Hispal. Orig. Lib. 16. cap. 4. & Sim. Maiolus colloq. Phys. admirand. colloq. 18. ^a Fortun. Liceti. de Lucern. Lib. cap. 11. ^b Geo. Agricola de Natura Fossilium Lib. 5.

added to it, taken from its downy filaments, to discriminate it from all the rest of the Alums.

From the *light gray* colour of its lanuginous parts, it is call'd by some *Polia*; by others *Corsoides*; and from its likeness to the *hoary fibres* of some sort of *Matweed*, *Spartopolia*^c. From the capacity it has of being spun into thred, it is also call'd *Linum*, with some distinguishing *Epithet* taken either from its *quality*, such as *asbestinum*, or *vivum*^d; or from the place where found, in general or particular: it being call'd in general *Linum fossile*; in *Englisb*, *Earth-flax* and in particular *Linum Indicum* by *Cælius Rhodiginus*^e; *Linum Creticum* by *Strabo*^f; *Linum Cyprium* by *Pancirollus*^g; also *Carpasium* by *Plutarch* and *Rhodiginus*, from *Carpasia* a City in *Cyprus*, near which it is found^h; and *Linum Carystium*, by *Pausanias* from a Town of that name in *Negropont* where it was also dugg^k. But beside these places that have given *Epithets* to the thred made of it, it is also found in *Tartary*, as *M. Paulus Venetus*^l and *Mr. Waite* agree; and as *Agricola* informs us, at *Namur* in the *Low-Countries*; at *Eisfeld* in *Thuringia*; amongst the mines in the old *Noricum*; somewhere in *Egypt*, and in the mountains of *Arcadia*^m; Also at *Puteoli* as *John Hæssus* acquaintsⁿ; and lately in some mines in *Italy* by *Signior Marco Antonio Castagna*^o. To which we may add our own *Country*, it having been yet lately met with in a small *Island* belonging to *William Robinson Esq*; called *Ynis Molroniad*. i. e. the *Island of Sea-calves*, in the parish of *LLan-Fair yng Hornwy* in *Anglesey* in *Wales*.

Secondly as to the *natural principles* of it, though it be commonly by the *Lithographers* reckon'd among *stones*, I rather should judg it a *terra lapidosa* or middle substance

^c Ibidem. ^d C. Plinii 2^o. Nat. Hist. Lib. 19. cap. 1. ^e Cæli. Rhodigini Lect. antiq. Lib. 18. cap. 31. ^f Strabonis rer. Geograph. Lib. 10. ^g Guid. Pancirolli rer. deperdit. Tit. 4. ^h Cæli. Rhodigini Lect. Antiq. Lib. 14. cap. 18. & Vid. Geo. Agricola de Nat. Fossil. Lib. 5. ⁱ Mar. Pauli Venet. de Reg. or b. Oriental. Lib. 1. cap. 47. ^m Geo. Agricola Ibid. ⁿ Pet. Andr. Matthioli Epist. Lib. 3. ^o philosoph. Transact. Numb. 166. 72.

between a stone and an earth ; but whether the one or the other, made of a mixture (I guess) of some *Salt* or other, and a *pure earth* without *Sulphur*, coagulated in the *winter*, and harden'd to perfection by the heats in *Summer*. Which *Salt* *Johannes Hæssus* proves by a very cogent argument to be *Alumen liquidum*, describing it, as *Matthiæolus* also does ^p, to be a *whitish lacteous substance* somewhat inclining to *yellow*, that sweats out of the *earth*, and smells like *Rotten cheese*: whereof having gather'd a quantity at *Puteoli*, together with the other *Species's* of *Alum*, and kept it a while by him, when he came to look on it again, he found it to have lost the smell, and a great part of it changed into *Alumen Plumeum* ^q: the *Saline* part (I suppose) shooting into *threads*, and the *pure earth* uniting them, as found in the places wherever generated: whether *sweating* from the *earth* as *Pliny* and *Matthiæolus* would have it ^r; or *percolated* through *rocks*, as we find it in *Wales*, the veins of it there running through a rock of stone in hardness and colour not unlike *flint* ^t. And yet it seems to be made of much such an *Alum* as that of *John Hæssus* at *Puteoli* was, some of it being *straw-colour'd*, as if it still retain'd the *yellowness* that his *liquid bitumen* was said to have: which is a colour not given it by any *Author*, most of it being said to be *white* or *cinereous*; some of it *red*; and some of an *Iron* colour as *Agri-cola* tells us ^u; and I have some of the *Cyprian* by me sent from *Aleppo* by my worthy friend *Dr. Rob. Huntington* now *Provost* of *Trin. Coll. Dublin* whereof some is of a *light blew* or *pearl-colour*; and some of it has a cast of *Sea-green*. But however the whole mineral substances found at several places may differ in colour; yet I do not find but the *woolly* part of them all seems to be much the same, *viz.* of a *white Silver* colour, the threads very *fine*

^p And. Matthiæoli Comment. in Lib. 5. Dioscor. cap. 82. ^q Andr. Matthiæoli Epistol. Lib. 3. ^r C. Plinii 2^o. Nat. Hist. Lib. 35. cap. 15. & Andr. Matthiæoli Comment. in Lib. 5. Dioscor. cap. 82. ^s Philosoph. Transact. Numb. 166. ^t Geo. Agricola de Nat. Fossil. L. 5.

and slender, yet very ponderous, the smallest particles of them throughly wet, sinking in *water*; as I also found a very slender thrumm of the *Incombustible Linnen* given me by Mr. *Baily*; which Mr. *Waite* brought from *India*, would also doe: which renders it very probable that it is not a *vegetable*, but a *mineral substance*, notwithstanding the informations of *Conco* and *Keay-arear Sukradana* mention'd in Mr. *Waite's* Letter. I say, renders it probable, there being several woods, such as *Box*, *red-wood*, *Persian wood*,^u &c. that will sink in water.

Concerning the *manufacture* of it into *thred*, *cloth*, &c. our *Letter* is silent, but *Marcus Paulus Venetus* very luckily supplies this defect, acquainting us in his book *de Regionibus Orientalibus*, how, it is made in *Tartary* it self: where he says it is found in a certain mountain in the province of *Chinchinthalas*, and made into *cloth*, as he was inform'd by one *Curficar* a *Turk* who was *Superintendent* of the *Mines* in that *Country*, after this manner. The *Lanuginous mineral* or *Amianthus* being first dried in the *Sun*, is next pounded in a *brass mortar*, and the *earthy* part separated from the *woolly*, which is afterward *wash'd* from all filth whatever that may yet stick to it, and so, being thus purged, is then *spun* into *thred* like other *wool*, and after *wove* into *cloth*: which if *foul* or *spotted*, they cleanse, he says, by throwing it into the *fire* for an *hours* time, whence it will come forth unhurt, as white as *Snow*^w. Which very *Method* (as *Strabo* prescribes it) seems also to have been used in ordering the *Cretan Amiantus*, only with this addition, that after it was pounded, and the *earthy* part shook from the *wooly*, he says 'twas *comb'd*, and so does *Agricola*, which argues there was some of a greater length than any I have yet seen^x: what the *Cretan* might be I cannot tell, but the *Cyprian* I am sure is short enough, so is the *Welsh*, and so

^u Philosoph. Transact. Numb. 169. ^w Mar. Pauli Veneti de Regionibus Orientalibus Lib. 1. cap. 47. ^x Strabonis rer. Geograph. Lib. 10. & Geo. Agricola de Nat. Fossil. Lib. 5.

was all that was known in *Pliny's* time, who confesses it was very difficult to *weave* by reason of its *shortness, difficile textu propter brevitatem*: insomuch that I guess they used some *Art* to effect it, not discover'd by *Authors*, spinning it perhaps first together with *Tow*, and so weaving it into *cloth*, by which means 'tis likely it might hang together after twas *woven*, the *tow* being burnt away upon the first exposing it to the *fiery triall*; or else if they spun it alone, perhaps they might moisten it with *Gum-water*, or some other such *glutinous liquor*, to make it hang the better together, during the *spinning* and *working* it into *cloth*, which though burnt away upon the first *experiment*, yet the *Amiantus* once *woven*, in all probability might then hang together well enough of it self.

Thus having shewn the *Method* how *anciently*, and how possibly this *mineral* may be spun into *thread*, and consequently work't into *cloth* in our *Age*: let us next consider to what uses it ever was, or may be put. As to the former whereof *Pliny* informs us, that *Shrouds* of this *Linnen* were anciently used, at the *Royal Obsequies* of *K. K.* to wrap up their *Corps* in, so as that the *ashes* of their *bodies* might be preserved distinct from *those* of the *wood* which made the *funeral Pile*; and the *Letter* acquaints us that the *Princes* of *Tartary*, as *Yeay-arear Sukradana* was credibly informed, doe use such at this day for *burning* their *dead*: which I have had so well confirmed from other hands since my receipt of that *Letter*, that I have little reason to doubt of the thing; there being no incapacity on the part of the *cloth*: of which though, as the *Letter* says, some is not so *good* as the rest (as 'tis in most other *commodities*) yet I doe not find there is any so *bad*, but will so far resist the *fire*, as to perform this *office*: for though it must be acknowledged it does *diminish* every time it un-

dergoes the violence of the *fire*; yet this hinders not but it may, and will, doe that *Service* divers times, before it be renderd altogether useles. *Cælius Calcagnanus* says that some of the *Ancients* made them *cloths* of it^a; with whom agrees *Turnebus* in his *Commentary* upon *Varro*^a; and *Cælius Rhodiginus* tells us indefinitely that the *Indians* did make them *Garments* of it^b; but *Hieracles* restrains it to the *Brachmans* only^c. The *Wicks* for the *Perpetual Lamps* of the *Ancients* were also made of *this*, as the same *Rhodiginus* further acquaints us; the *Wick* of the golden Lamp of *Callimachus* that hung in *Acropoli* being made (as he says) *è Lino Carpasso*, of which the fire had no power^d. The *Emperor Constantin* also, as *Damasus* informs us, appointed a *Wick* to be made of this *incombustible flax*, which should perpetually burn in his *Baptistery* at *Rome*^e. And *Ludov. Vives* bears us Witness, that he saw many of these in Lamps, at *Paris*, that would never consume^h. That *Napkins*, *Mantles*, a *Purse* and *Rope* have been made of it, has been shewn already; and we are told that *Septalla*, *Canon of Millan* had thred, roaps, net-networks, and *Paper* of itⁱ. *Marco Antonio Castagna*, who lately found this *mineral* somewhere in *Italy*, knows how to prepare, and render it so tractable and soft, that it resembles well enough a very fine *Lambs-Skin*, which he can thicken and make thin to what degree he pleaseth, and maketh it thereby, like either to a very *white Skin*, or a very *white Paper*^k. We have also made *paper* of our *Welsh Amiantus* but lately here at *Oxford*, which will bear both *fire* and *Ink* well enough, the *Ink* only turning *red* by the *violence* of the *fire*^l.

Lastly, to shew the *reason* whence it is, that this sub-

^a Cælii Calcagnini Epistol. Quæst. Lib. 3. Epist. 1. ^b Andr. Turnebi Comment. in Varr. de Lingua Lat. ^c Cælii Rhodigini Lectio. Antiq. Lib. 18. cap. 31. ^d Vid. Geo. Agricola de Nat. Foss. Lib. 5. ^e Cælii Rhodigini Lectio. Antiq. Lib. 14. cap. 18. ^f Damasc. in Sylvestr. Pap. ^g Ludov. Vives in Scholio ad D. August. de Civitat. Dei. Lib. 21. cap. 6. ^h Musæum Regalis Societat. Part. 3. chap. 5. ⁱ Philosoph. Transact. Numb. 72. ^j Philosoph. Transact. Numb. 166.

stance should be so strangely privileg'd by *nature*, as to be wholly put out of the *power* of *fire*: we must consider first (that we doe it with clearness) the *Qualities* and *power* of *fire* it self; 2. the condition of the *things* most lyable to *fire*; and then 3. what *things* they are that *resist* it most, and *remain* after it has exercised its ultimate force. The *qualities* then and *power* of *fire* according to *Aristotle* are, ἀξερῖν τὰ μὴ ὁμοῖα, συσπῖν δὲ τὰ ὁμοῖα ^m, to *separat* things of a *different*, and *unite* those of a *like* nature. 2 The *Subjects* most apt to take *fire* and be dissolved by it, we find to be such *heterogeneous* bodies, in whose *pores* the most *Sulphureous* *bituminous*, and *aqueous particles* are lodg'd; which being seized by *fire*, are quickly put into motion, dilated, separated, and being thus made capable of flying away, are at last consumed; and dissolve the *frame* of those bodies whose *parts* before were *united* by them. When these are fled and gone, the *fire* naturally goes out, as having nothing now left to work upon, nothing remaining, but the *Salts* and *Earth* in the form of *Ashes*: which 3. in all sorts of compounds are the *things* that *resist* this *Element* most, and will remain after the most *exalted operation* it can be forced to. Nor doe the *Salts* only of *mixt bodies* thus baffle the force of *fire*, but the *simple ones* much more, as being more *homogeneous*, as we see in the *decrepitation* of *common Salt*, and *exsiccation* of *Vitriol*, which when the *aqueous parts* are once evaporated, are now a *pure simple homogeneous body*, no more *sensible* of the *fire*, the *decrepitation* ceasing, and nothing remaining that can be *dilated*, any further to break the *corns* of *Salt*. Now whatever the *fire* cannot *dilate*, it cannot *separate*, nor consequently *destroy*, or carry any thing from it, but what is *heterogeneous* and accidentally adhering to the outside of it: which is perfectly the case of our *incombustible Linnen*, whose *threads*

being altogether *homogeneous*, and nothing else but the *pure stria* of *liquid Alum*, as was shewn above, holding nothing of *Sulphur*, *bitumen*, or *water*, or any thing that is different or *heterogeneous* to it self, that can be *dilated* or *separated*, it is in no possibility indeed of being *lyable* to the *fire*: which may indeed pass through it, as we see it does when 'tis made *red hot*, but can carry nothing from it; but such *accidental filth* as has been put upon it, or accrewed by useing.

And thus *Gentlemen* I have run through the several *branches* laid down above, according to the capacity of the *subject*, and my self; wherein if I have done well, you have your *desire*; if ill, you see I have not scrupled to hazard my *reputation*, to serve my *Friends*; so that I hope you will believe without a *Complement*, that I really am,

Your most humble

Servant, R. P.