

**Denn, was man
schwarz auf weiß
besitzt, kann man
getrost nach Hause
tragen.**

Wolfgang Coy

Hieroglyphen

A fragment of an ancient stone tablet, likely limestone, showing hieroglyphs. The fragment is irregularly shaped with a jagged top edge and a smoother bottom edge. The hieroglyphs are arranged in several horizontal lines, though they are somewhat faded and difficult to read. The stone has a light beige or tan color with some darker spots and a slightly rough texture.

Stein von Raschîd
(Fort Rosette)

196 BC

The Printing Press as an Agent of Change



Joseph quid agis, & profecto operaris
quod me profundissima admiratione suspen-
dit, herodem timens ne puerum perdat,
in egiptum cum puero & matre eius fugis.
Quod res stupenda nonne puer iste est parvulus
ille qui paucos ante dies natus est nobis,
cuius imperium ut propheta sanctus
ait super humerum eius, deus fortis pater
futuri seculi, princeps pacis, nimis profe-
cto arbitratus es herodis potentiam, ut me-
tueres ne parvulum perderet, cui est potestas
immensa, maiestas infinita, et insuperabilis.

Nahezu alle
Blockbücher
zwischen
1420-1480
sind verloren

gentes: incipientibus ab iherosolima. Vos autē testes estis horū. Et ego mit-
tam pmissum patris mei i uos: uos
autē sedet in ciuitate. quoaduisq; indu-
amini uirtute eē alto. Duxit autē eos
foras in bethaniam: et eleuatis mani-
bus suis benedixit eis. Et factū est dū
benediceret illis recessit ab eis: et serba-
tur in celum. Et ipsi adorantes regres-
si sunt in iherosalem cum gaudio ma-
gno: et erant semper in templo lau-
dantes et benedicentes deum amen.

Hic est iohannes euange-
lista un⁹ et discipulus dñi:
qui uirgo a deo electus ē:
quē de nuptijs uolentem
nubere uocauit deus. Cui uirginitati
in hoc duplex testimoniū datur in eu-
angelio: qd et pre ceteris dilectus a deo
dicit: et hinc matrem suā de uice com-
mendauit dñs. ut uirginē uirgo serua-
ret. Deniq; manifestans in euangelio
qd erat ipse incorruptibilis uerbi opus
inchoans. solus uerbu carne factum
esse. nec lumen a tenebris cōprehensū
hābisse testatur: primū signū ponēs qd
in nuptijs fecit dñs ostendens qd ipse
erat: ut legentibus demonstraret qd ubi
dñs inuitatus sit debet nuptiarū ui-
num debeat: et uentibus immutatio-
nis omnia que a testis instituit
apparet. Hic aut euāgelii scripsit in
asia. postea qd i paxmos insula apo-
caliptim scripsit: ut ui i principio ca-
nonis incorruptibile principii pnotat
in genesi: ei etiā incorruptibilis finis
p uirginē i apocalipti redderet dicere

in epheso. per multa signora experimen-
ta pmetis cū dū descendens i desolū
sepulture sue locū facta oratione. po-
situs est ad patres suos: tam egreant
a dolore mortis qd a corruptione car-
nis inuentus alienus. Tamen post o-
mnes euāgelii scripsit: et hoc uirgini
debetat. Quorū tamē uel scriptorū rēpo-
ris dispositō. uel librorū ordinatio ideo
a nobis per singula non rēponitur:
ut sciendi desiderio collato et querē-
tibus fructus laboris: et deo magiste-
rii doctrina seruetur.

In principio erat uerbu: et uerbu erat
apud deū: et de⁹ erat uerbu. Hic erat
in principio apud deū. Omnia p ipm
facta sunt: et sine ipō factum est nichil.
Quod factū est in ipō uita erat: et uita
erat lux hominū: et lux in tenebris lu-
cet: et tenebre eā nō cōprehenderūt. Fu-
it homo nullus a deo: cui nomē erat io-
hānes. Hic uenit i testimoniū ut testi-
moniū phiberet de lumine: ut omnes
credereēt p illū. Nō erat ille lux: sed ut
testimoniū phiberet de lumine. Erat
lux uera: que illuminat omnē homi-
nem uenientem in hūc mundū. In mū-
do erat: et mundus p ipm factus est: et
mundus eū non cognouit. In ppria u-
nit: et sui eū nō receperūt. Quorū autē
receptū eū dedit eis potestatem filio-
rum dei fieri: hīs qui uolūt in nomine e⁹.
Qui nō eē sanguinibus neq; eē uolun-
tate carnis. neq; eē uolūtate uiri: sed
eē deo nati sunt. Et uerbu caro factum
est: et habitauit in nobis. Et uidimus
gloriā e⁹. gloriā quasi unigeniti a
patre: pleni gratiā et ueritate. Iohan-
nes testimoniū ueritatis. Iohan-

gentes: incipientibus ab iherosolima.
Vos autē testes estis horū. Et ego mit-
tam pmissum patris mei i uos: uos
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bus suis benedixit eis. Et factū est dū
benediceret illis recessit ab eis: et serba-
tur in celum. Et ipsi adorantes regres-
si sunt in iherosalem cum gaudio ma-
gno: et erant semper in templo lau-
dantes et benedicentes deum amen.

*Explicat euāgelii scdm lucā: nūcipit
magis in euāgelii scdm iohannē*

Hic est iohannes euange-
lista un⁹ et discipulus dñi:
qui uirgo a deo electus ē:
quē de nuptijs uolentem
nubere uocauit deus. Cui uirginitati
in hoc duplex testimoniū datur in eu-
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in nuptijs fecit dñs ostendens qd ipse
erat: ut legentibus demonstraret qd ubi
dñs inuitatus sit debet nuptiarū ui-
num debeat: et uentibus immutatio-
nis omnia que a testis instituit
apparet. Hic aut euāgelii scripsit in
asia. postea qd i paxmos insula apo-
caliptim scripsit: ut cui i principio ca-
nonis incorruptibile principii pnotat
in genesi: ei etiā incorruptibilis finis
p uirginē i apocalipti redderet dicere
testis ego sum alpha et ω. Et hic ē io-
hannes: qui scribens supuenisse diem re-
tullus sui. Conuocans discipulis suis

in epheso. per multa signora experimen-
ta pmetis cū dū descendens i desolū
sepulture sue locū facta oratione. po-
situs est ad patres suos: tam egreant
a dolore mortis qd a corruptione car-
nis inuentus alienus. Tamen post o-
mnes euāgelii scripsit: et hoc uirgini
debetat. Quorū tamē uel scriptorū rēpo-
ris dispositō. uel librorū ordinatio ideo
a nobis per singula non rēponitur:
ut sciendi desiderio collato et querē-
tibus fructus laboris: et deo magiste-
rii doctrina seruetur. *Explicat pibgus
Iuapit euāgelii scdm iohannē. Ca. 1.*

In principio erat uerbu: et uerbu erat
apud deū: et de⁹ erat uerbu. Hic erat
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facta sunt: et sine ipō factum est nichil.
Quod factū est in ipō uita erat: et uita
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testimoniū phiberet de lumine. Erat
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nem uenientem in hūc mundū. In mū-
do erat: et mundus p ipm factus est: et
mundus eū non cognouit. In ppria u-
nit: et sui eū nō receperūt. Quorū autē
receptū eū dedit eis potestatem filio-
rum dei fieri: hīs qui uolūt in nomine e⁹.
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tate carnis. neq; eē uolūtate uiri: sed
eē deo nati sunt. Et uerbu caro factum
est: et habitauit in nobis. Et uidimus
gloriā e⁹. gloriā quasi unigeniti a
patre: pleni gratiā et ueritate. Iohan-
nes testimoniū ueritatis. Hic erat que dixi: qd post
me uenturus est: ante me factus est:

Digital Information lasts forever

or five years*



*whatever comes first

Veränderungen der Hardware

µProzessoren
Wortlängen

8 bit

16 bit

32 bit

64 bit

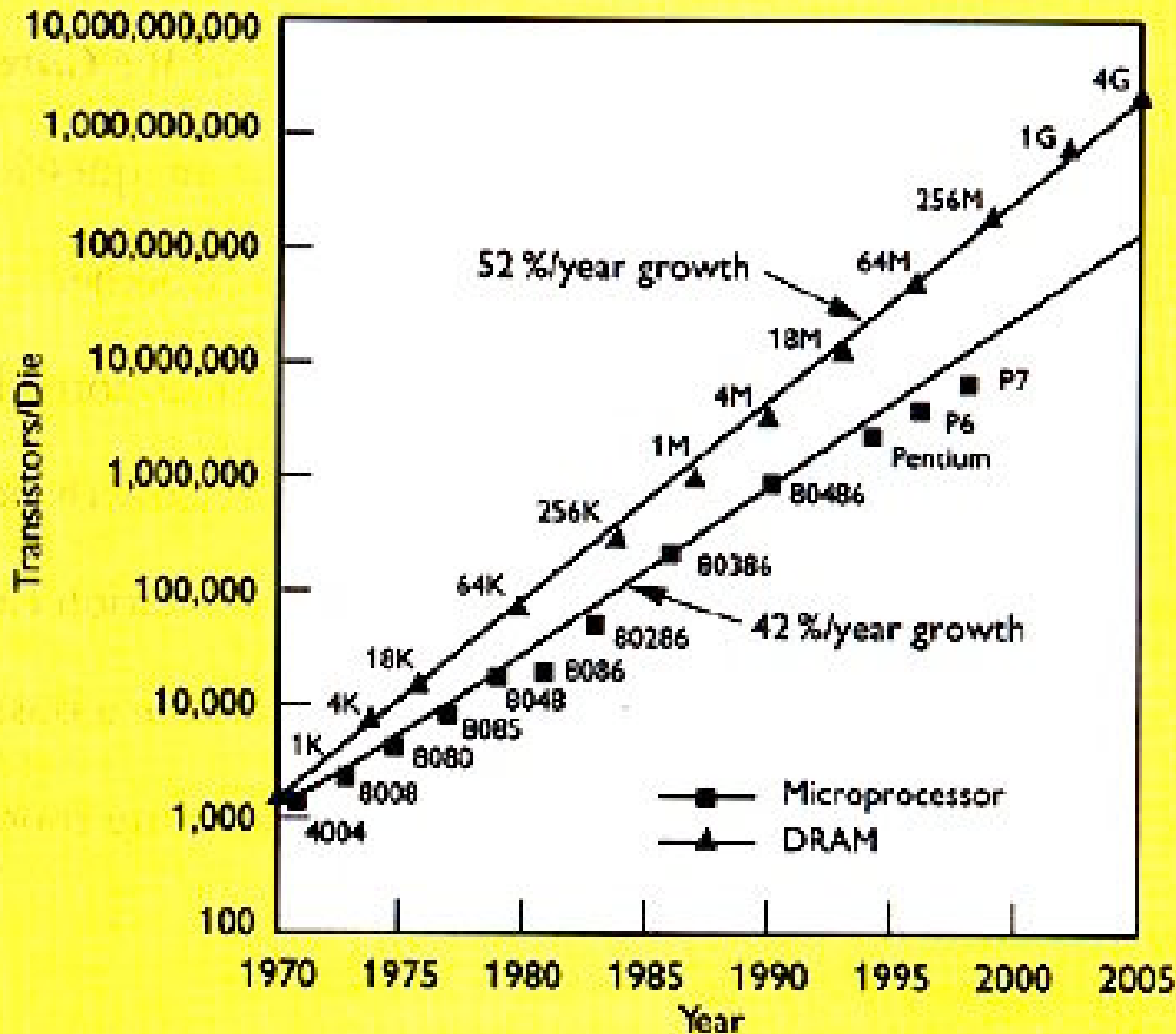
Mainframes
System /360 +
Adresslängen

24 bit Adressen

31 bit Adressen

64 bit Adressen

Moore's Law



alle 18 Monate...

I want to build
a clock that ticks
once a year.

The century hand
Advances once every
100 years, and the
cuckoo comes out
on the millennium.

I want the cuckoo
to come out every
millennium for the
next 10,000 years.

If I hurry, I should
finish the clock
in time to see the
cuckoo come out
for the first time.

Dan Hillis, The Millennium Clock, *Wired*, 1995.

Hardware



Magnetplatten

10 MB Mainframe 1965

100 GB Laptop 2005

1 TB im Jahr 2007 ?

Aktuelle Rate nichtkorrigierbarer Fehler 10^{-15}

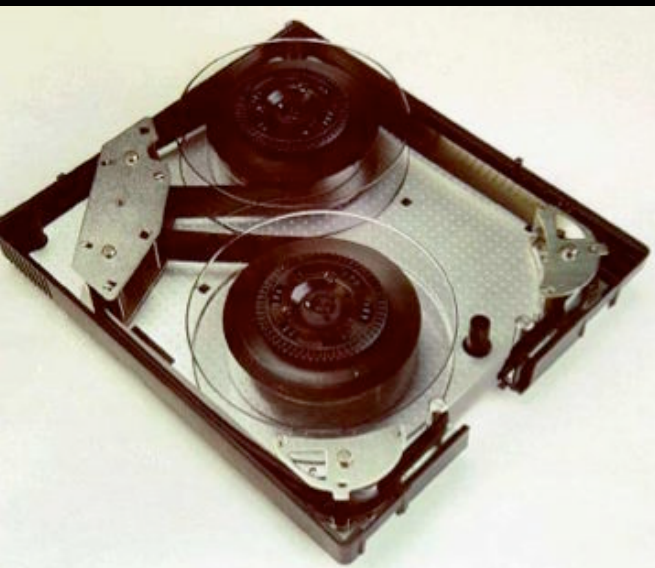
Haltbarkeit 5-10 Jahre ?



Magnetbänder

Technologische Haltbarkeit ca. 5 Jahre

Physische Haltbarkeit 15-30 Jahre ?

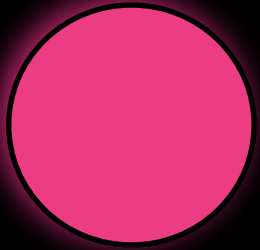


1999 IBM 3590E mit 20 GB pro
Kassette

2005 Linear Tape Open-Standard
(LTO) Kassetten mit 400 GB
unkomprimiert

Optische Speichermedien

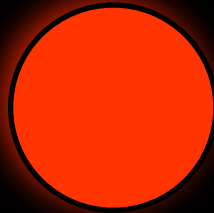
CD



780nm

650MB

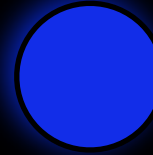
DVD



650 nm

4,7GB

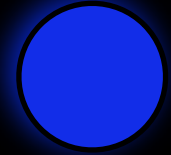
HD DVD



405nm

15GB

BluRay



23GB

Audio CD:

192 Byte Daten werden mit 588 Bit gespeichert
(650 MB von gespeicherten 2300 MB)

Computer Output on Microfilm – COM

Text und s/w-Bilder 80-100 Jahre
(im Salzstock)

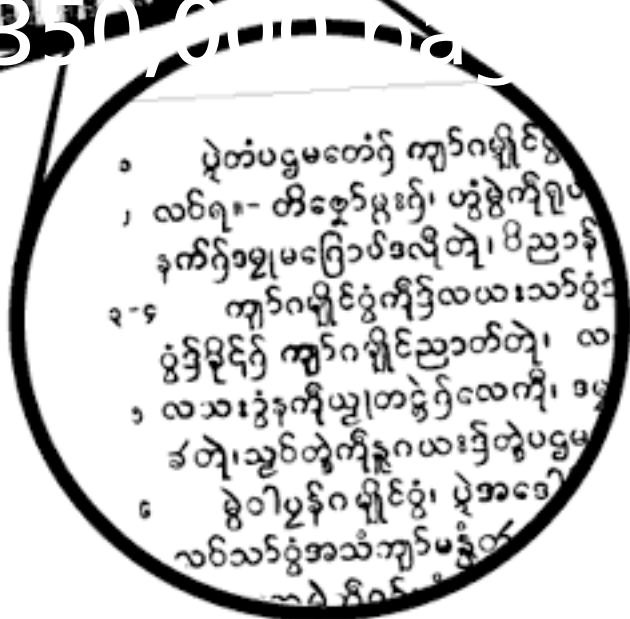
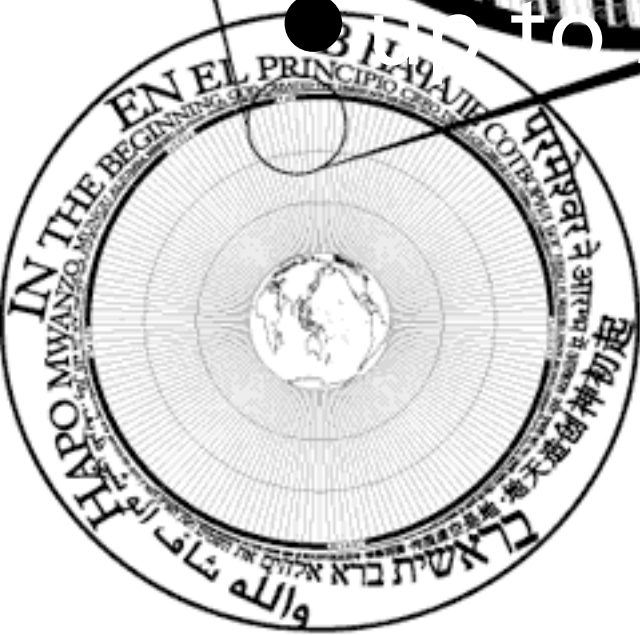
Farbmikrofilm deutlich weniger

Rosetta Stone Language Disk



- 7 1/2 inch (19.3 cm) disk

- 175 to 350 AD



Softwareformate: Text

TXT

RTF

DOC

SGML

HTML

XML

Softwareformate: Bilder

GIF

JPG

JPG2000

PNG

TIFF

Softwareformate: Audio

AIFF

MP3

Ogg Vorbis

AAC

ATRAC

FLAC

MIDI

Softwareformats: Video

RAM (RealMedia)

AVI (Audio Video Interleave)

MOV (QuickTime Container Format)

WMF (Windows Media Video)

MPEG 1,2,4

H264

Softwareformat: Multimedia

Data

+ Programs

+ Operating Systems

+ Machines

+ Compression

+ DRM

Umkopieren & Umkodieren

- Daten müssen regelmäßig **umkopiert** werden, um Datenverluste zu verringern.
- Daten müssen regelmäßig **umkodiert** werden, um mit aktuellen Geräte, HW und SW genutzt werden zu können.

Rekodieren komprimierter Artefakte

Qualitätsverluste kaum vermeidbar:

Falling back to Analog ?

Emulatoren



MAME Multiple Arcade Machine Emulator

JVM Java Virtual Machine

Apple 68K to PowerPC, PowerPC to Intel

Ein Recht auf Bewahren: Copyright-Probleme

Library of Congress Announces Copyright Circumvention Exemption for Ebooks

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2. **Computer programs protected by dongles** that prevent access due to malfunction or damage and which are obsolete.

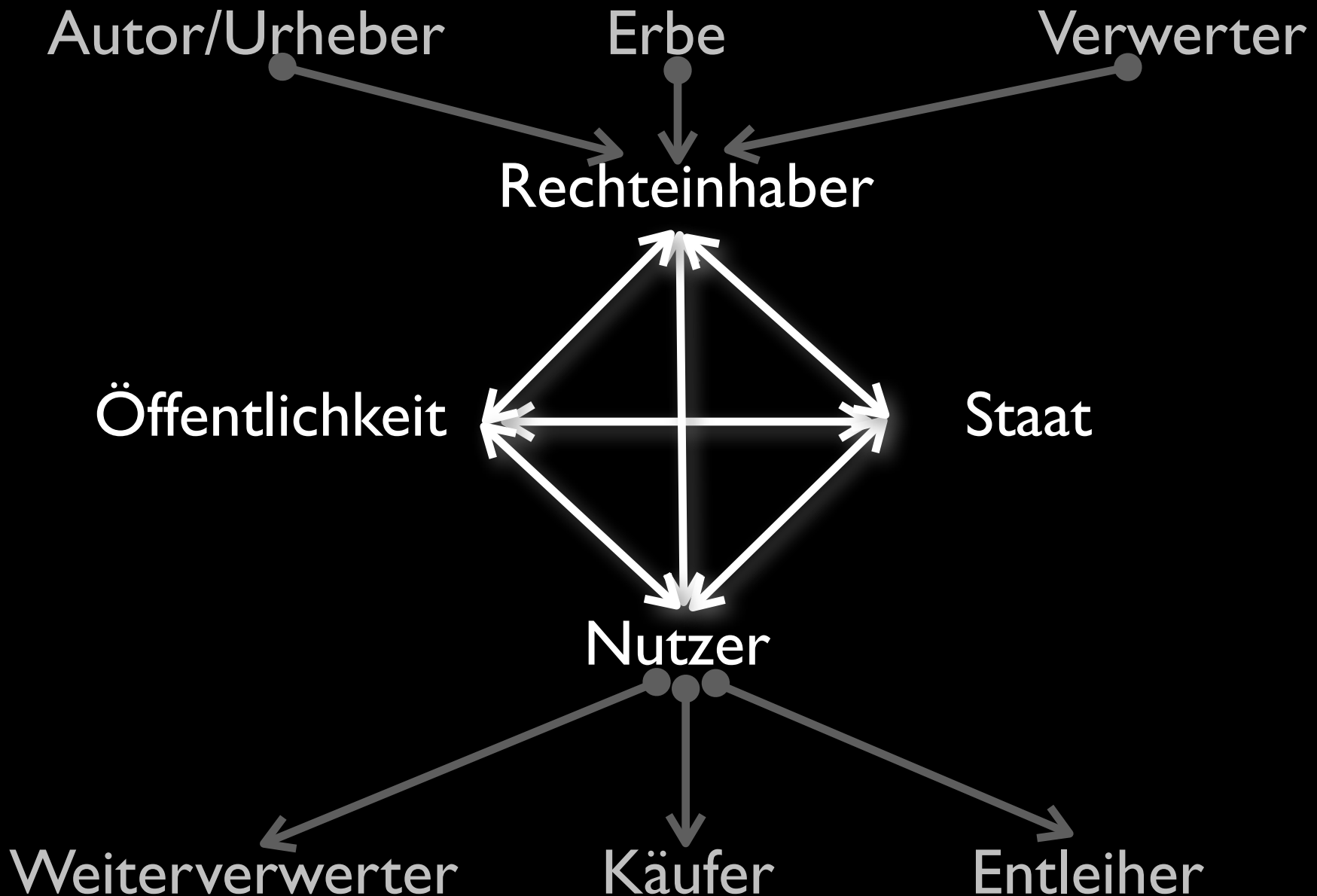
3. **Computer programs and video games distributed in formats that have become obsolete and which require the original media or hardware as a condition of access.** A format shall be considered obsolete if the machine or system necessary to render perceptible a work stored in that format is no longer manufactured or is no longer reasonably available in the commercial marketplace.

4. **Literary works distributed in ebook format** when all existing ebook editions of the work (including digital text editions made available by authorized entities) contain access controls that prevent the enabling of the ebook's read-aloud function and that prevent the enabling of screen readers to render the text into a specialized format.

Recht auf Erhaltung: DRM-Probleme

Genehmigung oder Verbot
einzelner Nutzungsvorgänge

Rechtsbalance



Danke