# Newtons Ausgangsfrage

Was ist die Ursache für die längliche Ausdehnung des Spektrums bei der Brechung des Sonnenlichtes durch das Prisma?

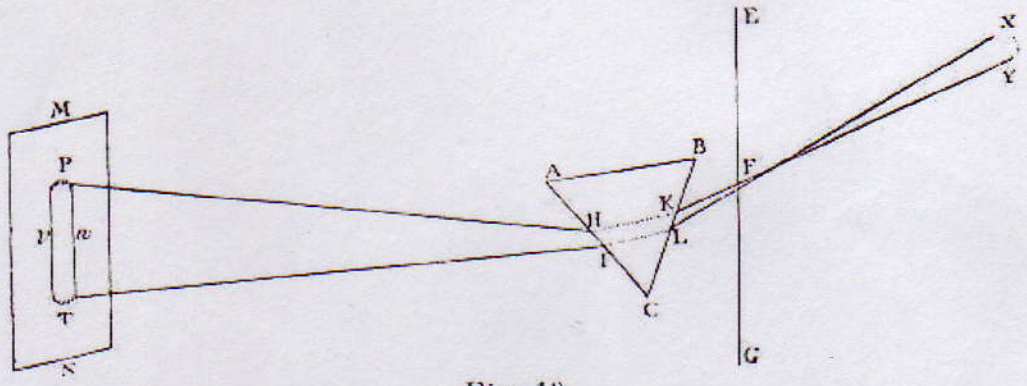



Fig. 13.

„In dem Jahre 1666, als ich mich mit dem Schleifen von Linsengläsern von anderer als Kugelform beschäftigte, verschaffte ich mir auch ein dreiseitiges Glasprisma, um damit die berühmten Farbenerscheinungen zu untersuchen. Zu dem Zwecke verdunkelte ich mein Zimmer, schnitt zum Einlassen einer passenden Menge Sonnenlichts eine kleine kreisrunde Öffnung in den Fensterladen und setzte mein Prisma so hinter die Öffnung, daß das Licht nach der gegenüberliegenden Wand gebrochen wurde. Es war zuerst eine angenehme Belustigung, die lebhaften und intensiven Farben zu betrachten, welche dadurch hervorgebracht wurden, als ich sie aber nach einiger Zeit sorgfältiger beobachtete, erstaunte ich, ihre Form länglich zu finden, während diese nach dem angenommenen Brechungsgesetz doch eine kreisförmige hätte sein sollen. Die Farben waren an den langen Seiten von geraden Linien begrenzt; an den Enden nahm das Licht so allmählich ab, daß es schwer hielt, die Figur des Bildes zu bestimmen, doch schien dieselbe hier kreisförmig zu sein. Beim Vergleichen der Länge dieses farbigen Spektrums mit seiner

Breite fand ich die erste fünfmal größer als die letztere, ein so starkes Mißverhältnis, daß mich das äußerst lebhafte Verlangen überkam, die Ursache desselben zu erforschen."

# Newtons Antwort

„And so the true cause of the length of that Image was detected to be no other, then that *Light* consists of *Rays differently refrangible,* [...]“

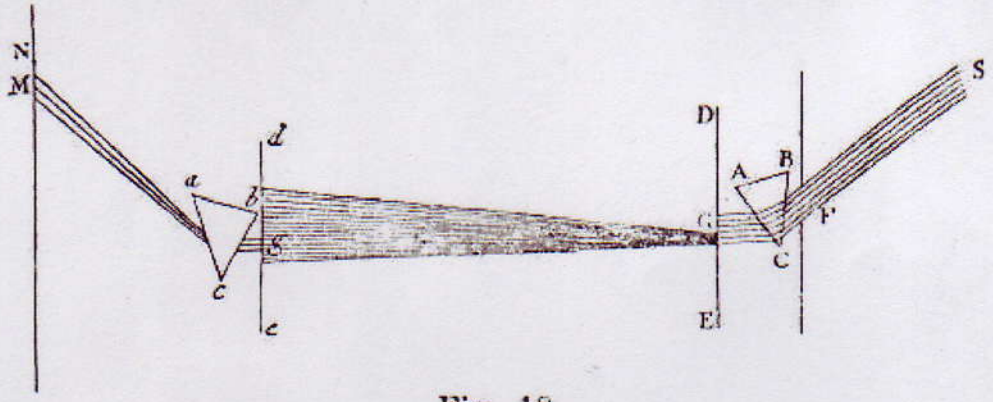



Fig. 18.

# *Experimentum Crucis*

# Text

The gradual removal of theſe ſuſpitions, at length led me to the *Experimentum Crucis*, which was this: I took two boards, and placed one of them cloſe behind the Priſme at the window, ſo that the light might paſs through a ſmall hole, made in it for the purpoſe, and fall on the other board, which I placed at about 12 feet diſtance, having firſt made a ſmall hole in it alſo, for ſome of that Incident light to paſs through. Then I placed another Priſme behind this ſecond board, ſo that the light, trajected through both the boards, might paſs through that alſo, and be again refracted before it arrived at the wall. This done, I took the firſt Priſme in my hand, and turned it to and fro ſlowly about its *Axis*, ſo much as to make the ſeveral parts of the Image, caſt on the ſecond board, ſucceſſively paſs through the hole in it, that I might obſerve to what places on the wall the ſecond Priſme would refract them. And I ſaw by the variation of thoſe places, that the light, tending to that end of the Image, towards which the refraction of the firſt Priſme was made, did in the ſecond Priſme ſuffer a Refraction conſiderably greater then the light tending to the other end. And ſo the true cauſe of the length of that Image was detected to be no other, then that *Light* conſiſts of *Rays differently refrangible*, which, without any reſpect to a difference in their incidence, were, according to their degrees of refrangibility, tranſmitted towards divers parts of the wall.

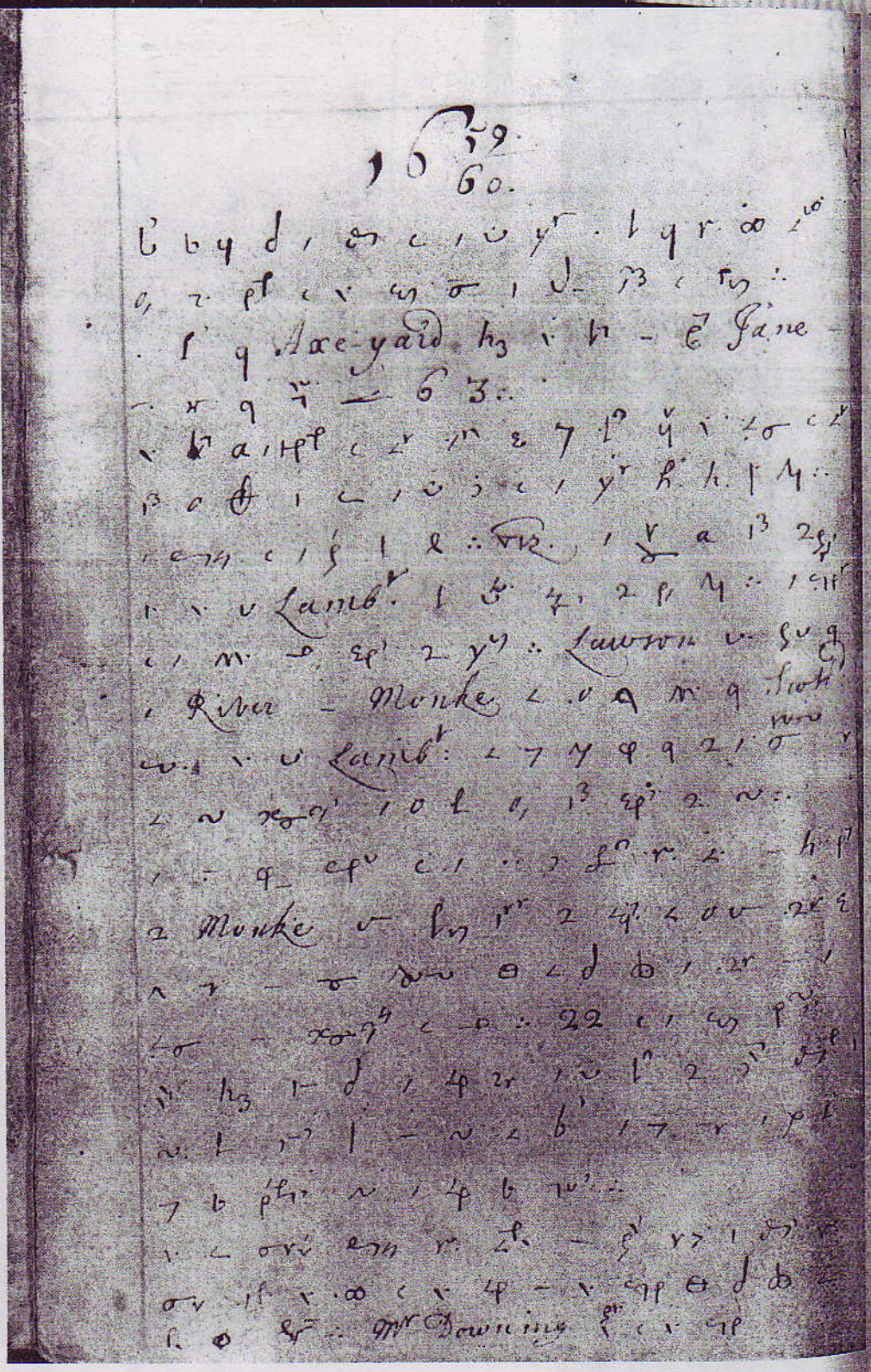
1666 - Großer Brand in London

Aus: Samuel Pepys - Das geheime Tagebuch

Der Brand tobt mehrere Tage lang!

*2. 9. 1666 (Tag des Herrn)*

Einige unserer Mädchen saßen bis spät in die Nacht auf, um alles für unser Fest heute vorzubereiten; und Jane weckte uns um drei morgens, um uns von einem großen Feuer zu berichten, das sie in der Stadt sahen. So stand ich auf und zog meinen Schlafrock über und ging an ihr Fenster und glaubte, es sei höchstens auf der hinteren Seite der Marke Lane; aber da ich keine Erfahrung hatte mit solchem Feuer, wie dieses nachher wurde, glaubte ich es weit genug weg und ging wieder zu Bett und schlief weiter. Stand gegen sieben wieder auf, um mich anzuziehen, und blickte aus dem Fenster und sah das Feuer nicht so groß, wie es gewesen war, und weiter weg. Dann in mein Kabinett, um nach dem gestrigen Saubermachen aufzuräumen. Darauf kommt Jane und sagt mir, daß sie gehört hat, daß heute nacht 300 Häuser durch das Feuer niedergebrannt sind, das wir sahen, und daß es jetzt die ganze Fish Street hinunterbrennt an der London Bridge. So machte ich mich umgehend fertig und ging zum Tower und stieg dort auf einen der höher gelegenen Plätze, Sir J. Robinsons kleiner Sohn mit mir; und da sah ich die Häuser an dem Ende der Brücke alle in Flammen und ein ungeheuer großes Feuer auf beiden Seiten auf der Brücke, was mich unter anderen Leuten wegen des armen kleinen Michell und unserer Sarah auf der Brücke bekümmerte. Dann hinunter, mein Herz voll Kummer, zum Kommandanten des Tower, der mir erzählt, daß es heute früh in der Hofbäckerei in der Pudding Lane begann und daß es schon die St-Magnus-Kirche und den größten Teil der Fish Street verbrannt hat. Dann



21. The first page of Pepys's Diary as he wrote it, showing the mixture of shorthand and longhand and the beautifully clear shaping and spacing. He put '1659/60' because the new year did not start until Lady Day, 25 March, according to the calendar then in use.

18. Engraving from 1683 English edition of Tolet's surgical text, showing a patient bound and held in preparation for the removal of a bladder stone, the operation Pepys underwent in 1658.

known to be a hideously
. 'In this great and danger-
stle together, that no man
d one treatise for surgeons,
ıeir peace with God before
ıe operation was always in
ıain caused by the stone.[39]
of St Thomas's and Bart's,
:rating for thirty years and
y commonwealth fighters.
ıat was called the 'cutting
to be a private patient and
l arrangement. His cousin
d since the boyhood visits
n in her house in Salisbury
yer, she had one or two
ful and generous woman.
e at his disposal. Her offer
Pepys's father went about
y as he could to pray for
: maternal aunt, a 'poor,
, 'did do me good among
desires pray for me when
:ar'.[40] No doubt Elizabeth

ıtion in the spring. Both
:, and the surgeon hoped
vhat he was doing. Pepys
arations took some time.
ılm frame of mind and to
ence in the surgeon, even
ɔmes from contemporary
to give their patients an
o. Wine was not allowed
inks made from almond,
ıt, chicken, pigeon, eggs,
:fore the operation Pepys
ssibly an unprecedented

experience – and kept in a warm bed. His belly would be rubbed with unguents, he would be bled in the arm and given gentle purges, until the final day, when he was left in peace and simply served with a good meal.

The operation was performed in the patient's bedroom. On the day of the surgery a lightly boiled egg was recommended, and a talk with a religious adviser. For Sam, whether he ate the egg or spoke with a clergyman, the day was 26 March. He had a last bath, was dried, told to take a turn or two about the room and offered a specially prescribed drink made of liquorice, marshmallow, cinnamon, milk, rosewater and the whites of fifteen eggs – six ounces to be swallowed with an ounce of syrup of althea and other herbs, a large dose for a nervous man to swallow.[41] After this he was asked to position himself on a table, possibly covered with a straw-filled bag into which he could be settled while the process of binding him up began. Some surgeons thought it wise to say a few reassuring words at this point, because the binding was terrifying to many patients. They were trussed like chickens, their legs up, a web of long linen strips wound round legs, neck and arms that was intended to hold them still and keep their limbs out of the surgeon's way. The instructions for the binding alone take up several pages of one manual; and when it was done the patient was further bound to the table. He was shaved around his privy parts, and a number of strong men were positioned to hold him fast: 'two whereof may hold him by the knees, and feet, and two by the Arme-holes, and hands . . . The hands are also sometimes tyed to the knees, with a particular rowler, or the knees by themselves, by the help of a pulley fastened into the table.'[42] Meanwhile the surgeon lubricated his instruments with warm water and oil or milk of almonds: the catheter, the probe, the itinerarium, the specular, the pincers, small hooks and so forth; he also had powder to stop bleeding, sponges and cordial waters to hand. There were no anaesthetics, and alcohol was certainly not allowed to a patient undergoing surgery to the bladder.

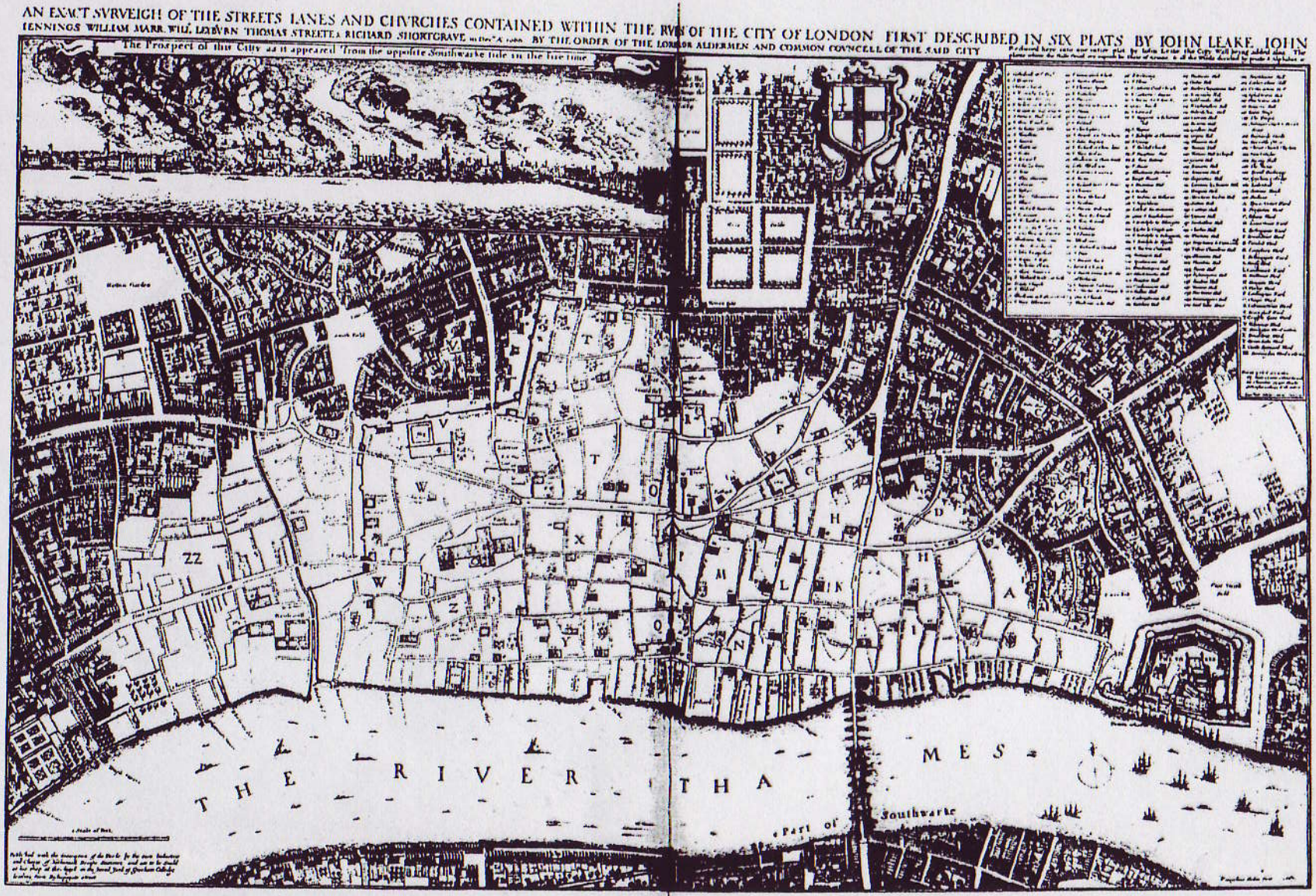
The surgeon got to work. First he inserted a thin silver instrument, the itinerarium, through the penis into the bladder to help position the stone. Then he made the incision, about three inches long and a finger's breadth from the line running between scrotum and anus, and into the neck of the bladder, or just below it. The patient's face was

sponged as the incision was made. The stone was sought, found and grasped with pincers; the more speedily it could be got out the better. Once out, the wound was not stitched – it was thought best to let it drain and cicatrize itself – but simply washed and covered with a dressing, or even kept open at first with a small roll of soft cloth known as a tent, dipped in egg white. A plaster of egg yolk, rose vinegar and anointing oils was then applied.[43]

Pepys, no doubt by now fainting with shock and pain, was unbound and moved to his warmed bed. A cold syrup of lemon juice, radishes and marshmallow was ready for him to drink.[44] The first dressing was left for twelve hours, and the thighs were kept tied to help the wound heal naturally. There was no question of getting out of bed for a week. Broth, cinnamon water and soothing drinks were given during the first day of recovery, and when he felt like something more an austere vegetable diet of succory (chicory), endive and spinach was recommended. There was further anointing of his belly with oils; oil of earthworms was held in readiness against possible convulsions, and a purge given if necessary, but only after two weeks. Fever, insomnia and pain were all to be expected, and above all, you would think, acute anxiety. Was the bladder healing? How soon might he expect it to function normally again? If he moved, would he tear the just healing wound open? Had the surgeon missed the prostate, something the manual worried about? Pepys was the type of patient who is likely to have read it for himself. We know that he sought information and anatomical explanations from the doctors who attended him, as he recalled when he saw a corpse dissected at the Surgeons' Hall in 1663, and took a particular interest in the bladder and kidneys.[45]

Recovery, for those who did not succumb to secondary infection, was expected to take thirty to forty days. Pepys made it in thirty-five. It was a triumph. By his own account he was himself again by 1 May: exactly two years later he wrote in his Diary for 1 May 1660: 'This day I do count myself to have had full two years of perfect cure for the stone.' Hollier could be proud of his work, especially considering the size of Pepys's stone, described as 'very great' by his medical colleagues; it was as big as a tennis ball, according to Evelyn, who saw it later. Real tennis, the only kind then played, uses very slightly smaller balls than modern lawn tennis, but still with a diameter of about 2¼ inches; the stone must have been exceedingly awkward to

London nach dem Brand




*16. London nach dem großen Brand*