Nicole Oresme

Auszug aus „Tractatus de configurationibus qualitatum et motuum“ (ca. 1370)

Quelle : Nicolaus Oresmius: Nicole Oresme and the medieval geometry of qualities and motions: a treatise on the uniformity and difformity of intensities known as Tractatus de configurationibus qualitatum et motuum/ edited with an introduction, English translation, and commentary by Marshall Clagett. - Madison, Wis.: Univ. of Wisconsin Pr., 1968

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III.vii On the measure of difform qualities and velocities

Every quality, if it is uniformly difform, is of the same quantity as would be the quality of the same or equal subject that is uniform according to the degree of the middle point of the same subject.[1] I understand this to hold if the quality is linear. If it is a surface quality, [then its quantity is equal to that of a quality of the same subject which is uniform] according to the degree of the middle line; if corporeal, according to the degree of the middle surface, always understanding [these concepts] in a conformable way. This will be demonstrated first for a linear quality. Hence let there be a quality imaginable by ΔABC, the quality being uniformly difform and terminated at no degree in point *B* [see Fig. 21(a)]. And let *D* be the

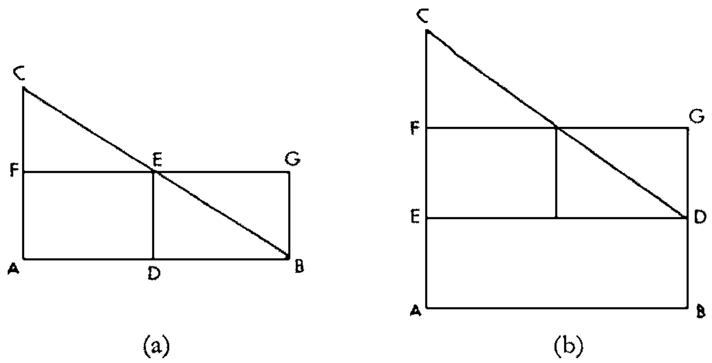

Fig. 21

Figures in *BLSJG.* Figures are rotated through 90° in MS *G.* In figure (b) in MS *L,* there is no center perpendicular. In MS *J,* line *ED* is missing and the center perpendicular is marked *KH.* Both figures are reversed in MS *J*.

middle point of the subject line. The degree of this point, or its intensity, is imagined by line *DE.* Therefore, the quality which would be uniform throughout the whole subject at degree *DE* is imaginable by rectangle *AFGB*, as is evident by the tenth chapter of the first part. Therefore, it is evident by the 26th [proposition]

[1] „Omnis...linearis.“ – This is, of course, the famous Merton College Rule of uniformly diform. And this chapter with its geometric proof constitutes the most significant chapter of the work, historically speaking, as I have shown in considerable detail in Introduction II.B. For the origin and earliest expositions of the Merton Rule, see *The Science of Mechanics*, Chapter V.
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of [Book] I [of the *Elements*] of Euclid[2] that the two small triangles *EFC* and *EGB* are equal. Therefore, the larger ΔBAC, which designates the uniformly difform quality, and the rectangle *AFGB*, which designates the quality uniform in the degree of the middle point, are equal. Therefore the qualities imaginable by a triangle and a rectangle of this kind are equal. And this is what has been proposed.

In the same way it can be argued for a quality uniformly difform terminated in both extremes at a certain degree, as would be the quality imaginable by quadrangle *ABCD* [see Fig. 21(b)]. For let line *DE* be drawn parallel to the subject base and ΔCED would be formed. Then let line *FG* be drawn through the degree of the middle point which is equal and parallel to the subject base. Also, let line *GD* be drawn. Then, as before, it will be proved that $\Delta CED = \square EFGD$. Therefore, with the common rectangle *AEDB* added to both of them, the two total areas are equal, namely quadrangle *ACDB*, which designates the uniformly difform quality, and the rectangle *AFGB*, which would designate the quality uniform at the degree of the middle point of the subject *AB*. Therefore, by chapter ten of the first part, the qualities designatable by quadrangles of this kind are equal.

It can be argued in the same way regarding a surface quality and also regarding a corporeal quality. Now one should speak of velocity in completely the same fashion as linear quality, so long as the middle instant of the time measuring a velocity of this kind is taken in place of the middle point [of the subject].[3] And so it is clear to which uniform quality or velocity a quality or velocity uniformly difform is equated. Moreover, the ratio of uniformly difform qualities and velocities is as the ratio of the simply uniform qualities or velocities to which they are equated. And we have spoken of the measure and ratio of these uniform [qualities and velocities] in the preceding chapter.

Further, if a quality or velocity is difformly difform, and if it is composed of uniform or uniformly difform parts, it can be measured by its parts, whose measure has been discussed before. Now, if the quality is difform in some other way, e.g. with the difformity designated by a curve, then it is necessary to have recourse to the mutual mensuration of the curved figures, or to [the mensuration of] these [curved figures] with rectilinear figures; and this is another kind of speculation.[4] Therefore what has been stated is sufficient.

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[2] „per...Euclidis" – Proposition I.26 in the Campanus version of the *Elements* (ed. Of Basel, 1546, 22-23) runs: "Omnium duorum triangulorum, quorum duo anguli unius duobus angulis alterius et uterque se respicienti aequales fuerint, latus quoque unius lateri alterius aequale, fueritque latus illud aut inter duos angulos aequales, aut uni eorum oppositum, erunt quoque duo unius reliqua latera duobus reliquis alterius trianguli lateribus, unumquodque se respicienti aequalia, angulusque reliquus unius angulo reliquo alterius aequalis." And thus, with the sides and angles of the two triangles proved to be equal by this proposition, the triangles are themselves equal.

[3] „De...mensurantis." – This statement shows that Oresme realized that the same geometric proof holds for uniformly difform motion, i.e., uniformly accereated motion. Hence it is clear that this proof is essentially the same as Galileo's first theorem in the "Third Day" of the *Discorsi*, as I have stated several times in Introduction I and II, and which has been Known since the early researches of Pierre Duhem.

[4] „alterius" – Zoubov, *Traktat*, 610, had read this as *altioris*, although all of the manuscripts have *alterius*. The result is that Zoubov has Oresme saying that the treatment of "difformly difform" is the "object of higher speculation."