'Pythagoras of Ulm' and the Geometry of a 19th C Oud.

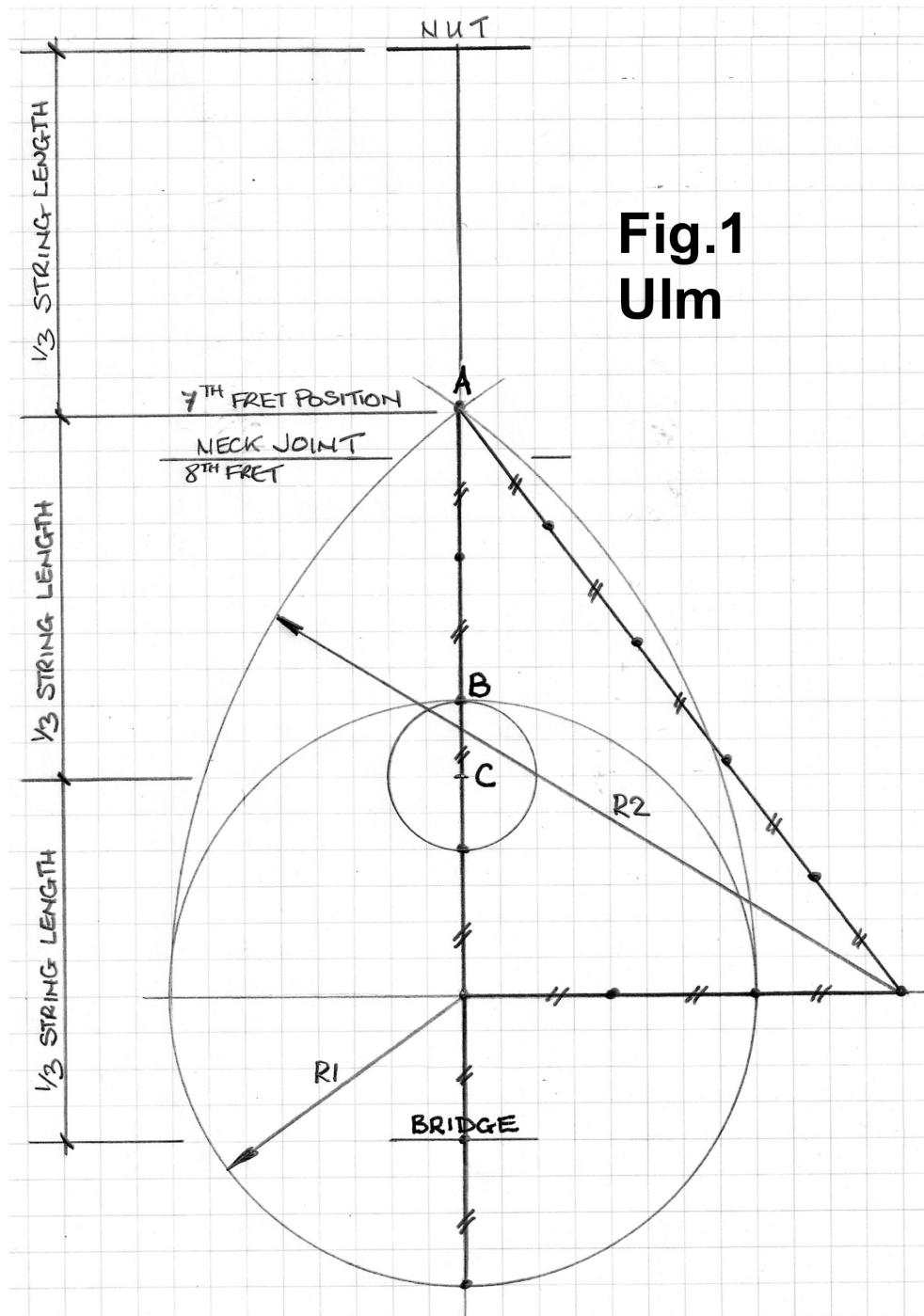Among the Appendices of Mark Lindley's book "Lutes, Viols and Temperaments" is an article "Lute Design and the Art of Proportion" by Gerhard C. Sohne which explores some of the more basic geometrical possibilities of lute design from a study of the extant instruments. As no lutes survive from the 15th C., for this period the author turns to the iconography for an example - choosing for analysis the well known late 15th C. carving (c. 1470) by Jorg Syrlin the Elder of 'Pythagoras with Lute' in Ulm cathedral.

 Sohne proposes a geometrical construction for this representation of a lute that is elegant in its simplicity – based upon the familiar ancient 'Pythagorean' right angled triangle with a hypotenuse measuring 5 units and the other two sides measuring 3 and 4 units respectively (see Fig 1).
The maximum width of the face measures 4 units and the sound hole diameter 1 unit. The bridge is located at 1 unit from the bottom of the face or 3 units from the top of the sound hole. The radius (R1) describing the lower section of the face measures 2 units and the radius (R2) describing the upper section measures 5 units. The top of the sound hole touches the arc described by R1 at point B on the centerline of the face.
The vibrating string length measures 7.5 units.

Fig.1
Ulm

NUT

⅓ STRING LENGTH

⅓ STRING LENGTH

⅓ STRING LENGTH

7TH FRET POSITION

NECK JOINT
8TH FRET

A

B

C

R2

R1

BRIDGE

Unfortunately, although the profile of the 'Ulm' lute, its sound hole position and diameter are all a reasonably close match, the length of the fingerboard is too short. In Sohne's construction, the neck length has been increased to accommodate eight frets to the neck joint with the 7th fret located at point A in the geometry (1/3 of string length or the Pythagorean ratio 3/2). However, the neck represented in the carving is only long enough for seven frets - fret 7 being located at the neck joint - a fretting arrangement that would have been typical for a lute of the Mediaeval period (as well as for an oud of the time). Note also that the bridge

position – derived from the geometrical construction - cannot be verified as it is obscured in the carving by the lute player's hand.
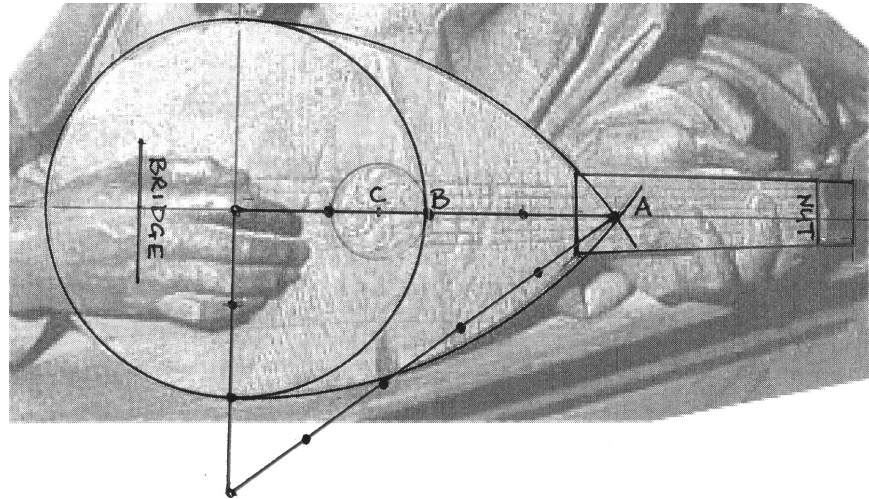
There are no surviving lutes that have this characteristic semi circular shape of the lower section of the sound board (although Arnault de Zwolle's drawing of a lute from the mid 15th C. does). However, there are some old ouds that appear to have very similar profiles. One such example is an oud made by the Al Arja brothers of Tripoli in 1892.
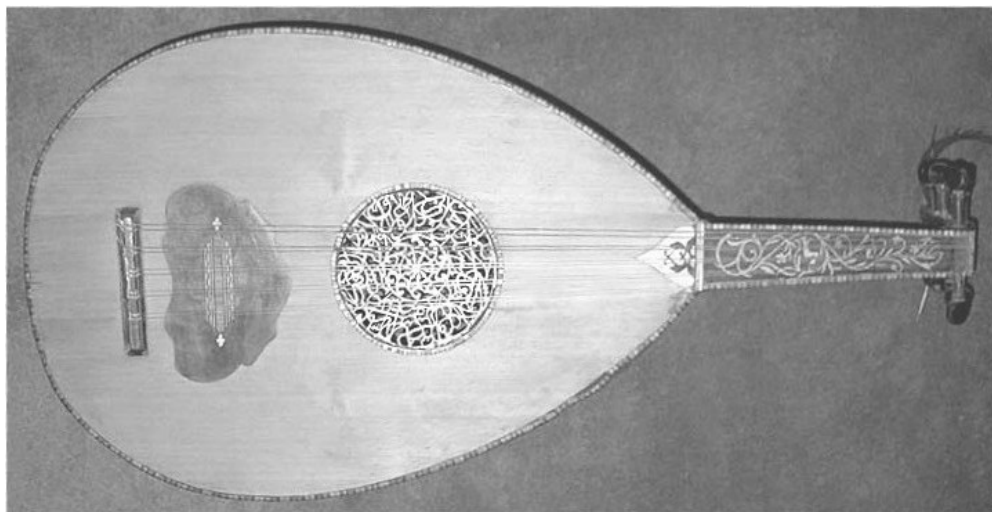

Al Arja Oud Prior to Restoration

Working from high resolution 'full face' images of the oud (taken with a long focus lens, to minimize optical distortions), the profile was compared to that of the geometrical construction given in Fig. 1 above.

The profile of the face of the restored Al Arja instrument is very close to that of the proposed 'Ulm' lute geometry, however, the fingerboard length is again proportionally slightly shorter. As well the sound hole is proportionally larger in diameter.

Traditionally, the length of the fingerboard of an oud (front edge of the nut to neck joint) is set at 1/3 string length and the distance from neck joint to the center of the sound hole and from the center of the sound hole to the front edge of the bridge is also set at 1/3 string length in each case.
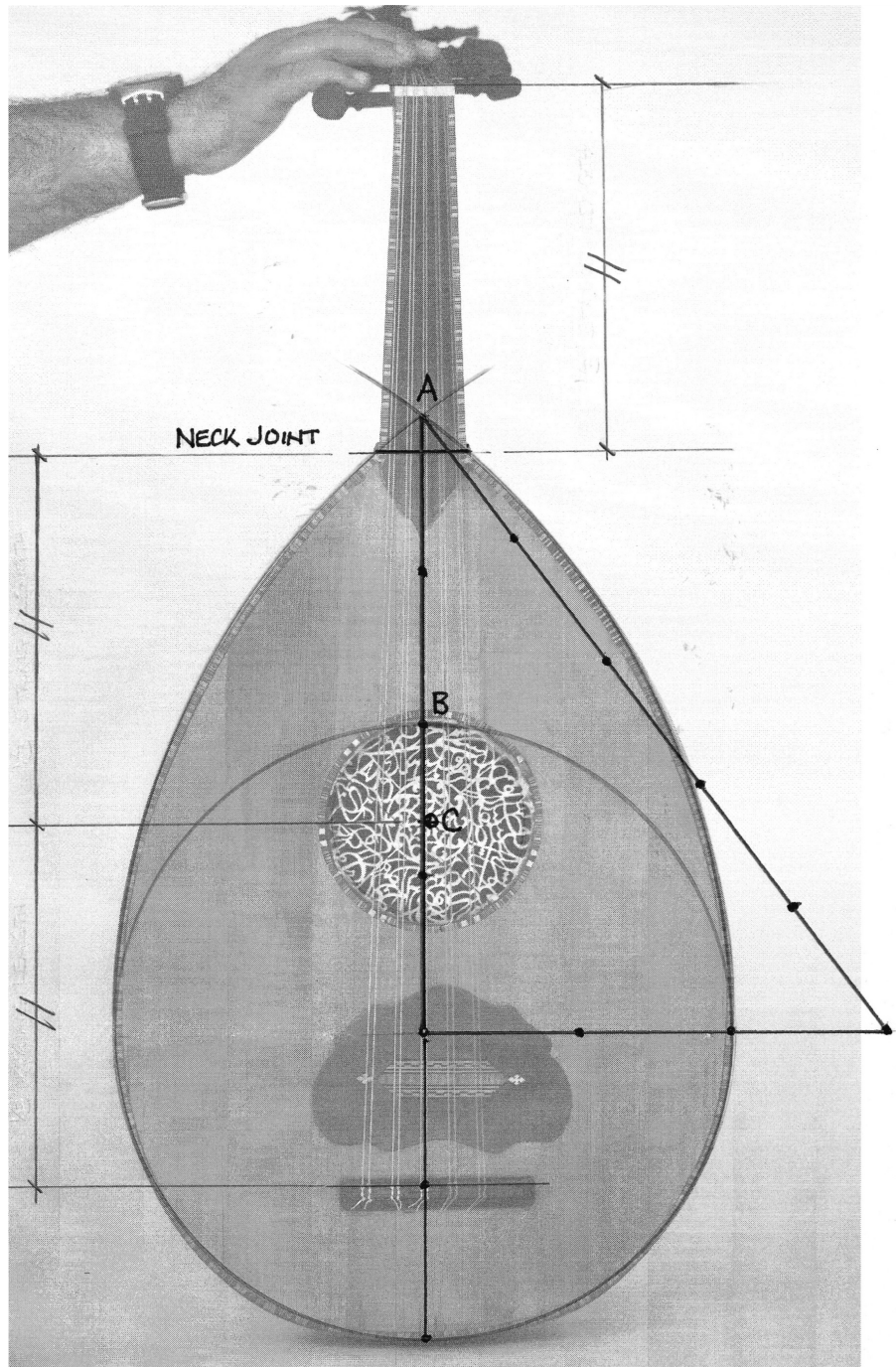
In order to resolve these differences, the geometrical construction required the following slight modification (See Fig. 2):

After creation of the basic sound board profile - based on a 3:4:5 'Pythagorean' right triangle - the neck joint position is first established, knowing the required width of the fingerboard at the neck joint (about 55 mm for a six course oud). The distance from the neck joint to front edge of the bridge is then divided equally to give the location of the center of the sound hole. The relatively lower position of the sound hole centre results in a larger sound hole diameter than that given by the Ulm lute geometry.
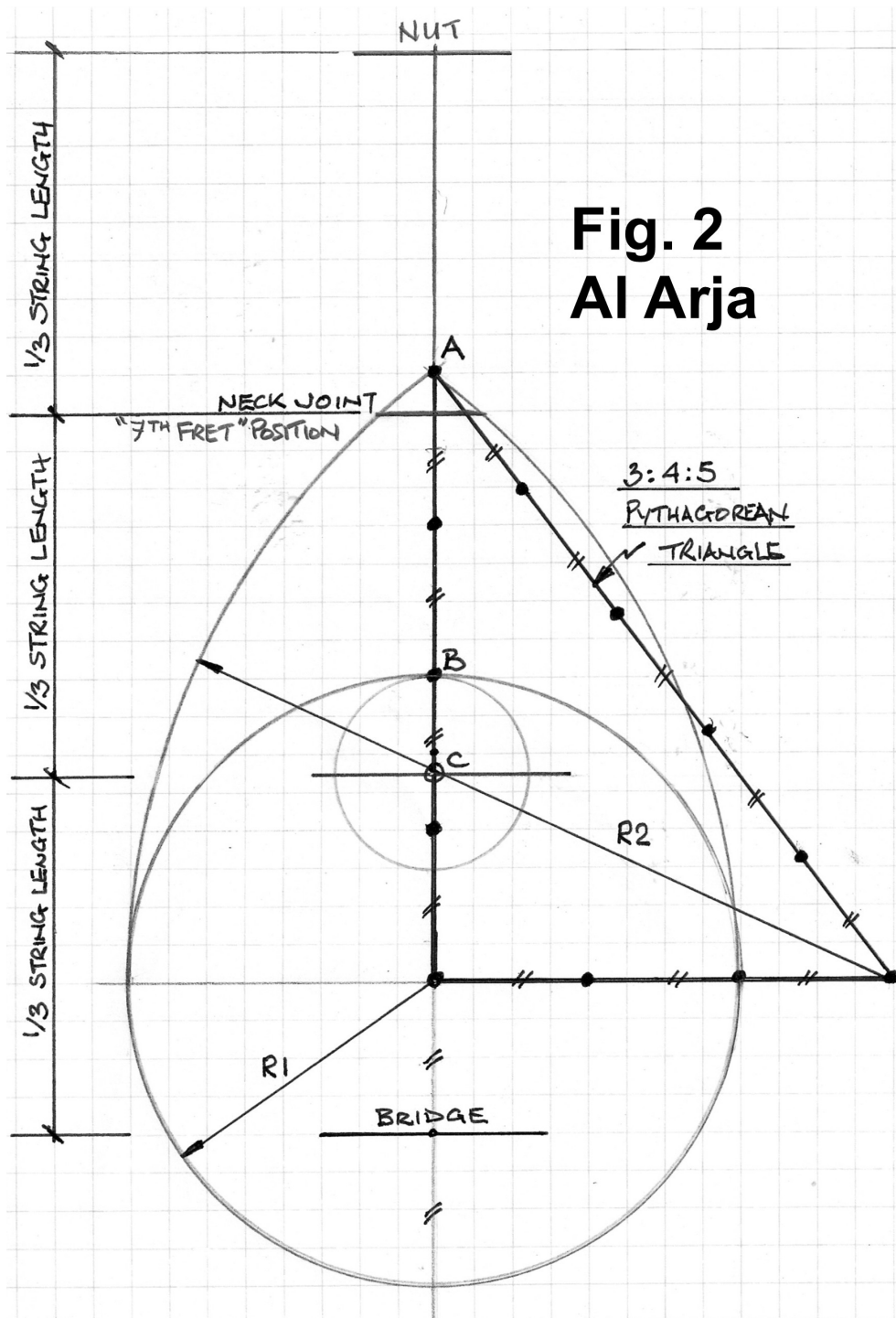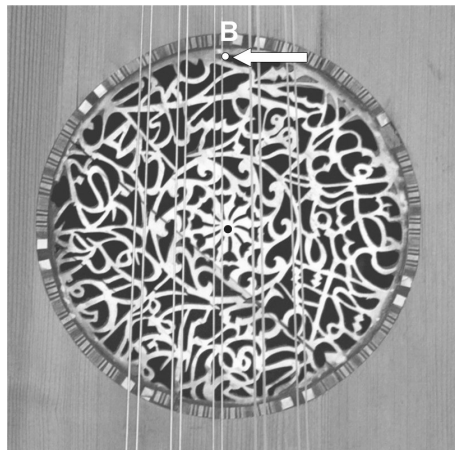

Fig. 2
Al Arja

Note that the actual sound hole diameter is the diameter of the open area of the rosette – point B being the top of the sound hole.

The fingerboard of the restored oud is a few millimeters shorter than its original length due to repeated repairs and adjustments to the string 'action' over the years (resulting in some permanent loss of material at the neck joint) and a new nut that is slightly thicker than original. The original fingerboard – it is estimated – would have been about 5 mm longer and possibly about 5 mm wider at the neck joint.
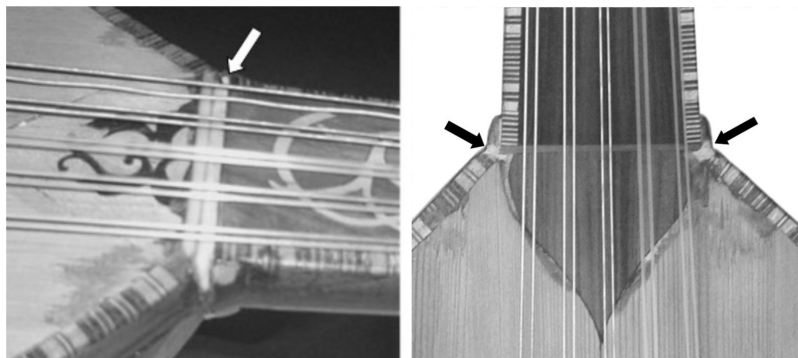
Neck Repairs

This oud is in the collection of Mahmoud Korek.
Many thanks to Mahmoud for kindly providing images and detailed information about the instrument for this Comm. The oud originally fitted with six double courses with a string length of about 63 cm. now has five double courses.
Little is known of the Al Arja family of luthiers of Tripoli. They apparently were also furniture makers still active in Lebanon during the early 20th C. - according to the script on one of their surviving instrument labels.
It is not known if there ever was a direct connection between the Al Arja luthiers and the German lute making tradition in 15th C. Europe.