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Paulus Paulirinus of Prague

on Musical Instruments

STANDLEY HOWELL

THE *Liber viginti artium*, written over the period 1459 to 1463 by Paulus Paulirinus of Prague, is an encyclopedic dictionary of the arts and sciences, probably intended for university students. The treatise has received little attention from scholars in other fields, but its section on musical instruments is of great importance to organologists, for Paulirinus was the first author to attempt a comprehensive, literal description of a contemporary instrumentarium.

It is significant that such an innovation should have come in a general encyclopedia rather than in an exclusively musical treatise. Medieval music theorists rarely evinced any interest in practical applications of their art; the elevation of such subjects to legitimacy alongside traditional speculative topics is one of the indicators marking the transition between medieval and Renaissance music theory. Technical detail about contemporary instruments was not treated as an integral part of a purely musical treatise until Ramos de Pareja's appropriately titled *Musica practica* of 1482.

Paulirinus's work, on the other hand, forms part of a tradition of encyclopedic tracts extending back to the early medieval compendia of Cassiodorus and Isidore of Seville. Isidore's *Etymologiarum sive originum libri viginti* was frequently used as a model, and because he included explanations of the names of musical instruments, his imitators did likewise. Indeed, later works generally do little more than paraphrase Isidore's definitions; at most some authors try to link

I am indebted to Vaclav Laska for helping me cope with several sources in Czech, and especially for making a detailed comparison of my translation to Paulirinus's original Latin and Růžena Mužíková's Czech version.

contemporary exemplars with the ancient names. Paulirinus accepts Isidore's choice of subject matter as a point of departure and repeats some legendary associations of instruments with classical and biblical figures, but he describes the instruments themselves without slavish dependence on any traditional authority. Unfortunately the relevant part of the only manuscript of his encyclopedia is incomplete, and the definitions of individual instruments which do survive are designed to give only enough information to identify them. Still, we find here more specific detail about a greater variety of instruments than is available from any other written source through the end of the fifteenth century.

The instrumental portion of the treatise has been edited several times, but the only published version known to most scholars is incomplete and contains numerous errors, omissions, and even unacknowledged additions.¹ Paulirinus's contribution to organology is principally known through a selection of details cited out of context,² and the lack of a complete translation into any language other than Czech has caused a great deal of valuable information to be misrepresented or simply to go unreported. This article offers a brief introduction, text, translation, and commentary.

Born of Jewish parentage at Prague in 1413, Paulus Paulirinus is often referred to as Pavel Žídek ("Paul the little Jew").³ But he was

1. Josef Reiss, "Pauli Paulirini de Praga Tractatus de musica (etwa 1460)," *Zeitschrift für Musikwissenschaft* 7 (1924-25): 259-64. Other editions are: (1) H. Seidl, "Der 'Tractatus de musica' des Pergament-Kodex Nr. 257 Krakau unter besonderer Berücksichtigung der Musikinstrumenten-Kunde" (Ph.D. diss., Karl-Marx-Universität Leipzig, 1957); I have not been able to obtain a copy of this study, but Mužíková (see below) records some of its variant readings. (2) Růžena Mužíková, "Musica instrumentalis v traktátu Pavla Žídka z Prahy," *Miscellanea musicologica* (Prague) 18 (1965): 85-114; the article includes a somewhat faulty text, Czech translation, and commentary.

2. Most recently and extensively in Sibyl Marcuse, *A Survey of Musical Instruments* (New York: Harper and Row, 1975), and idem, *Musical Instruments: A Comprehensive Dictionary*, corrected ed. (New York: W. W. Norton & Co., 1975).

3. My summary of information on Paulirinus's life and his encyclopedia is based primarily on Josef Reiss, "Das Twardowski-Buch. Opus magicum des polnischen Faust," *Germanoslavica* 2 (1932-33): 90-101, and Zdeněk V. Tobolka, *M. Pavla Žídka Správovna*, Historický archiv České akademie císaře Františka Josefa pro vědy, slovesnost a umění, 33 (Prague: Nákladem České akademie císaře Františka Josefa pro vědy, slovesnost a umění, 1908), pp. i-v.

kidnapped in infancy and raised by a Hussite family, eventually receiving baptism in 1430. He studied the liberal arts, philosophy, and theology at the University of Vienna and earned a Master of Arts degree there. Subsequently he continued his education at the universities of Padua and Bologna, with an emphasis on medicine.

Returning north in 1440, he was ordained at Regensburg, and by 1443 he won a professorship at the University of Prague. From this point on, Paulirinus, who despite his Hussite upbringing had become an orthodox Roman Catholic, suffered a series of setbacks in his career at the hands of the powerful Hussite faction centered in Prague. He resigned his university post in 1444 to become a canon at Prague's Cathedral of St. Vitus, a bastion of orthodoxy. At this time he came to the attention of Pope Eugenius IV, who attempted to procure a bishopric for him, but negotiations to that end were still incomplete when Eugenius died in 1447, and ultimately proved futile. In 1448 he was driven from Prague by the Hussites and resettled in Pilsen.

Paulirinus resumed work toward a doctorate in theology at the University of Cracow in 1451, but never attained the degree. An outbreak of plague the following year caused him to flee to Wrocław, where he encountered the Franciscan monk John of Capistrano, who at that time was engaged in a one-man crusade to destroy the Hussite heresy. Paulirinus's subsequent activities were remarkably inconsistent and strange. He began writing secret reports on Capistrano's activities to the Hussite leader John Rokycana, Archbishop of Prague. One of these letters was intercepted, and Paulirinus was arrested at the instigation of Catholic authorities. In 1453 he recanted his Hussite allegiance and was released, but, after returning to Cracow, he was again imprisoned for participating in Hussite agitation against Capistrano. Ultimately it required the intercession of Cardinal Zbigniew Oleśnicki of Cracow with Pope Nicholas V to save his life and restore his freedom (1455). In virtual exile he went back to Pilsen, where he wrote the *Liber viginti artium* between 1459 and 1463. From 1466 we find him at the court of George of Poděbrad, the Hussite King of Bohemia, as a royal counselor. In this capacity he wrote his *Spravovna*, a slightly rambling guide to good government. He remained in Poděbrad's entourage until that sovereign's death in

1471. After this date we have no record of his activities, but he seems to have died soon after the death of the king.

The unique manuscript preserving Paulirinus's encyclopedia (Cracow, Uniwersytet Jagielloński, Biblioteka Jagiellońska, Codex 257) has a curious reputation. It was discovered in the mid-eighteenth century behind a marble slab commemorating King Ladislas IV (1595–1648) of Poland in a wall niche at the Jagellon University in Cracow. Contemporary scholars identified it with a book that had vanished from the library of the Jesuit College at Vilnius more than a century earlier. That volume was thought to have been a book of sorcery compiled by the legendary magician Twardowski, the Polish Faust. The only connection between the two came from a study published by two German scholars in 1723, before the discovery in Cracow, which claimed that Twardowski's manuscript had been hidden in a wall.⁴ The authors also remarked that the work had consisted of two books, one a dictionary of the sciences, the other devoted to the black arts. It was therefore assumed that the magical portion of the Cracow codex had been removed, and the remaining encyclopedia is still popularly called "the Twardowski book." Actually, the treatise's history is considerably more mundane: the surviving copy was purchased at Prague sometime after 1471 by Johannes Dlugossius, a tutor at the Polish royal court. He left it to his colleague Johannes Welss, who in turn willed it to the Jagellon University Library. What caused it to be hidden in the seventeenth century must remain a matter for speculation.

As it exists today the manuscript is a fragment of 359 oversize (60.5 × 38 cm.) vellum folios, lacking portions of both the beginning and the end. Of the title's twenty arts, fifteen remain: grammar, logic, rhetoric, arithmetic, astronomy, music, zoology, botany, mineralogy, topography, geography, medicine, metaphysics, theology, and law. The section on music (fols. 153^r–162^v), originally the seventh art, is also incomplete. According to its preface it was to have included five

4. Jakob Voit and Johann Sigismund Jungschultz, *De incrementis studiorum per Polonos et Prussos* (Leipzig, 1723), p. 68; quoted in Reiss, "Das Twardowski-Buch," p. 91.

parts, dealing with plainchant, mensural music,⁵ instrumental music, church music, and polyphonic music. The text breaks off after little more than one page of the discussion of instruments; it is not certain how much more material this part contained.

The codex is a copy by one Paulus de Novo Castro and is marred by many scribal errors. In the segment translated here these include substitutions of one instrument name for another, a problem which particularly afflicts Paulirinus's definition of *musica instrumentalis* (see Commentary). The text also makes apparently meaningless distinctions between *claves* and *clavos*, both used to mean "keys," and between singular and plural forms of *organum*, both translated here as "organ." Initial letters for each of the definitions are missing, but can be supplied with certainty except for the *calcastrum*, *innportile*, and *ormfa*. In these cases I have adopted the guesses put forward by Josef Reiss and Růžena Mužíková in their editions.

This edition was prepared from a microfilm of the manuscript. Original spellings are preserved, except that *u* and *v*, indistinguishable in the source, are resolved according to classical usage. The numerous abbreviations are expanded silently, with a few potentially ambiguous exceptions. Punctuation is editorial, and capitalization is supplied where required by punctuation and for proper names. All other deviations from the manuscript reading are recorded in footnotes, as are attributions of emendations suggested by previous editors.

Paulus Paulirinus: *Liber viginti artium* 7.3 (fol. 162^{r-v})

[I]NSTRUMENTALIS Musica est, que perficitur instrumentis musicalibus aut flatu humano mediante, aut sola percussione, aut follium flatu, aut flatu et percussione, vel appulsu, vel quocumque alio modo. Quod resonanciam dyafonialem faciendo

Instrumental music is that which is played by musical instruments, whether by the agency of human breath, percussion alone, the wind of bellows, wind and percussion, striking, or any other means. By making a polyphonic resonance it produces

5. A facsimile (incomplete and drastically reduced), transcription, and Czech commentary for this section is available in Růžena Mužíková, "Pauli Paulirini de Praga Musica mensuralis," *Acta Universitatis Carolinae; Philosophica et historica* 2 (1965): 57-86.

suaves reddit sonorum emergencias, in aeris fraccione usque ad medium miringe. Quibus recreantur spiritus vitales ac animales ita, ut erumpant in zelotipias et saltus et omnimodas hilaritates ac iocunditates, que humanitus haberi et experiri potest in dulcore.

[D]ECLARATIO diffinitionis est declaracio qua ostenditur, quod bene dicitur, que perficitur flatu humano propter fistulam, tubam, buccinam, tibiam, corneam, calamum, sambucam, liram, que non sonant nisi bucca humana sufflentur. Dicitur aut sola percussione sicut est citara, psalterium, arfa, timpanum, clavicimbalum, clavicordium, monocordum, dulce melos, tintinabulum, sistrum. Dicitur aut follium flatu sicut organa et portatiuum et [o]rmfa, que^a sub ascellis premitur. Dicitur aut flatu et percussione sicut [i]nnportile,^b quod percutitur et flatu follium perflatur. Dicitur appulsu propter nablum et rittoniam et alia, que ex metallorum tinniunt^c sonoritate apulsu percussione.

[M]ONOCORDUM est instrumentum longum in modum canne, longum intus concavum habens foramen et desuper unicam cordam nervalem, que pertranssit novem particulas alfabeto prepulcre divisas. Cuius corda percussa cum penna aut ligno, prius tamen sinistra manu registrata, multum artificialiter docet omnem melodiam confingere. Et est

sweet effusions of sounds, vibrating in the air all the way to the middle of the brain membrane. These sounds stimulate vital and living spirits to such a degree that they burst forth in enthusiasm, leaping, and all kinds of gaiety and cheerfulness which can be known and experienced of happiness by men.

A definition is a clarification, for it is well said "which is played by human breath" to account for the *fistula*, trumpet, *bucina*, *tibia*, *cornea*, shawm, *sambuca*, and *lyra*, which do not sound unless the human cheek is puffed out. "By percussion alone" is said to account for the lute, psaltery, harp, drum, harpsichord, clavichord, monochord, dulcimer, bell, and *sistrum*. "By the wind of bellows" is said to account for the organ, portable, and bagpipe (which is compressed under the armpits). "By wind and percussion" is said to account for the claviorganum, which is plucked and blown by the wind of bellows. "By striking" is said to account for the *nablum*, *rittonia*, and others, which ring with the struck-percussion sonority of metals.

The monochord is a long instrument in the shape of a boat. It has a long concave cavity inside and above it one gut string, which passes over nine carefully distributed marks [labelled with letters] of the alphabet. This string, first stopped by the left hand, [then] plucked with a quill or stick, most artfully demonstrates how to construct every melody. It leads

a. [o]rmfa, que] ysis quod; see *Commentary*

b. [i]nnportile] organum; see *Commentary*

c. tinniunt] tinnt; first n uncertain

instrumentum quod^d quasi manu ducit in omnia instrumenta intelligenda, et artis musice docet perfectam investigacionem, cuius primus repertor dicitur fuisse Bohecus.

[C]LAVICORDIUM est instrumentum oblongum in modum cistule, habens cordas metallinas geminatas et claves abante, quorum quidam ostendunt tonos quidam semitonia, sed breviores claves ostendunt b molles. Quo cum suo calcatorio datur magnum preambulum in studium organorum et aliorum, ut in isto instrumento bene edoctus, illius per se accipiat scienciam. Et est instrumentum vere musice tradens consonanciarum agnitiones.

[C]LAVICIMBALUM est instrumentum mire suavitatis in simphonando, habens cordas metallinas per omnes suos choros et abante clavos uti organum, qui forinsecus digittis tacti per pennam introrsus coannexam faciunt cordas resonare,^e dans modum in artes musicalis introitum et apprehensionem omnium differenciarum in tonis et vocibus. Et concordat in percussione cum clavicordio, nisi quod dulcius et sonorosius sonat.

[D]ULCE melos est instrumentum oblongum uno tantum foramine cavatum, in cuius superficie perambulans corde metalline, dans voces et sonos mire suavitatis, dum tum ligni-

[the student] as if by the hand to an understanding of all instruments, and it teaches a complete investigation of the musical art, which Boethius is said to have invented.

The clavichord is an oblong instrument in the shape of a small box. It has paired metal strings and keys in front, some of which produce whole tones and some semitones, but shorter keys produce the accidentals. This instrument, with its pedalboard, provides an excellent introduction to the organ and other instruments. Once [the student] has been well trained on this instrument, through it he can acquire an understanding of the other. It is an instrument which yields recognition of the consonances of music.⁶

The harpsichord is an instrument of wonderful sweetness for making music. It has metal strings in all its courses and keys in front (like the organ) which, struck by the fingers outside, make the strings sound by means of a quill connected [to each key] inside. It provides a means of introduction to the musical arts, and of comprehending all species of modes and pitches. Its attack is like that of the clavichord, except that it sounds sweeter and louder.

The dulcimer is an oblong instrument pierced by just one hole, and its surface is traversed by metal strings. It produces pitches and sounds of wonderful sweetness when it is struck

d. quod supplied by Reiss

e. resonare Reiss] resonora

6. This definition is also translated in Susi Jeans, "The Pedal Clavichord and Other Practice Instruments of Organists," *Proceedings of the Royal Musical Association* 77 (1950-51): 2.

culo percutitur aut penna indura aliquantum modicum indurata. Dulce melos dicibile, quod dulcissimam facit armoniam suo tinitu, et inter universa mihi placet resonancia.

[P]SALTERIUM est instrumentum forme trigonalis^f et interdum quadrate in modum clavicimbali dispositum dulcissime melodie. Psalterium dicibile a David psalta^g domini, qui ipse huius instrumenti^h primus dicitur fuisse repertor. In quo frequenter canendo psalmos meditabatur confingere et diversa canticorum genera. Cum penna percutitur tenta in manu, uti cithara.

[A]RFA est instrumentum trigonale nervalibus cordis unguum percussione resonans, ab Orfeo, primo huius instrumenti repertore, arfa dicta, porrigens sonos ad longam distanciam, et longiorem quam quodcumque aliud instrumentum preter tubam, organa, et portatiuum. Quod potest se contemperare cum omni instrumento musicali et in tacum forciorem aut minus fortem.

[C]ITHARA est instrumentum musicum conveniensⁱ ceteris propter sonorum suorum subtilitatem, habens quinque choros cordarum semper duplatas et novem ligaturas in collo, facientes sonorum varietates digitorum tamen registracione. Cuius concavum pectoris clibani habet officium, foramen vero oris. Collum vero habet similitudinem canne pulmonis, super quod digiti perambu-

with a small stick or a somewhat reinforced (but not hard) quill. It can be called a dulcimer because it makes the sweetest harmony by its ringing sound, and of all [instruments] its sonority is [most] pleasing to me.

The psaltery is arranged for the sweetest melody [partly] in a triangular shape and partly in a square shape, after the manner of a harpsichord. It may have been named the psaltery by David, God's musician, who is said to have been its inventor. He often improvised upon it while singing psalms and other kinds of songs. It is plucked with a quill held in the hand, like the lute.

The harp is a triangular instrument sounded by the plucking of fingernails on gut strings. It was named the harp by Orpheus, its inventor. It projects sounds to a great distance, indeed farther than any other instrument aside from the trumpet, organ, and portative. It may be combined with any musical instrument by plucking it harder or softer.

The lute is a musical instrument suitable [for combination] with others due to the subtlety of its sounds. It has five double courses of strings and nine frets on the neck, different pitches being produced by the placement of fingers [on the frets]. The hollow space [of its body] has the function of a chest cavity, while the opening [in the belly] functions as a mouth. The neck has a similarity to a

f. trigonalis] trigoā/nalis

g. psalta] psalte

h. instrumenti Reiss] instrumento

i. conveniens] conv+ -us *abbreviation*

lantes habent officium epiglotti. Percussio autem cordarum habet similitudinem pennularum pulmonum,^j a quibus vox efflagitur, sed corde nervalis gerunt lingue officium, quibus vox formatur. Citarista autem habet officium intellectus registrantis cantum.

[S]ISTRUM Smiczecz est instrumentum cithare per omnia similem, quo ad formam unitam autem habens cordam nervalis, que tractione crinium de caudis equorum et registratione digitorum in collo, uti in cithara, fabricat voces simphoniales dulcissime melodie. Quod^k si cithare coniungitur, in vocum sonoritate temperant se tanta suavitate, ut nulla instrumenta tam dulciter se copulare valeant in vocibus. Et hiis duobus instrumentis quinterna est aptissima.

[O]RGANUM est instrumentum habens cannas in modum fistularum in sursum erectas, que habent naturam gutturis humani, folles vero perflantes, et profunditate fistelle seu burdones^l emergentes habent proprietatem clibani pectoralis. Digtus vero tangens clavos forinsecos habet naturam epiglotti et pedales calcantes registrant notas graves. Et hoc vero instrumento utitur sancta Romana ecclesia in templis. Qualis autem sit modus cantandi in hoc instrumento et in aliis, pertranseo brevitatis ob causam.

[P]ORTATIVUM est instrumentum minus, organo similiter folliculo

windpipe, upon which moving fingers have the function of an epiglottis. Plucking the strings has a similarity [in function] to the lobes of the lungs, which emit the voice, but the gut strings bear the function of the tongue, which gives form to the voice. The lutenist functions as the intellect in playing a song.

The *sistrum* with bow is similar in all ways to the lute, having the same shape and even a gut string, which forms harmonious notes of the sweetest song from the drawing of a horsehair bow [over it] and the placement of fingers on the neck, as on the lute. When the lute is combined with it they blend in sonority of pitches and in sweetness better than any other instruments. And with these two instruments the gittern is most suitable.

The organ has reeds in the form of pipes stood upright (which have the nature of human throats), bellows, and pipes or *burdones* rising up from the bottom ([which] have the property of chest cavities). The finger, touching external keys, has the nature of an epiglottis, and foot pedals register the low notes. The Holy Roman Church makes use of this instrument in churches. What the mode of sounding may be in this instrument and in others I pass over for the sake of brevity.

The portative is a smaller instrument, similar to an organ with one

j. pennularum pulmonum] penularum pulmonis

k. Quod] que

l. burdones] burdone

uno et digitorum tactu sonos emittens ut organum, differens ab organo secundum unum eo, quod minus est. Portatiuum dicibile ab hoc, quod in manu gestari potest et dat voces temperaciores quam organum. Et qui scit cantare in organis, sciet et in isto instrumento, sed non e converso, quod plura requiruntur ad organa quam ad portatiuum.

[V]IRGINALE est instrumentum habens formam in modum clavicordii, habens cordas metallinas facientes sonoritatem clavicimbali, habens choros cordarum triginta duos,^m percussione digitorum in clavos preminentes, et in tonos et semitonia resonans suaviter. Virginal dictum, quod uti virgo dulcorat mitibus et suavissimis vocibus.

[C]IMBALUM est Nola parua introrsus habens lapillum, in omnibus partibus divisa ad quinque differencias, dans sonos suavissimos ad citharam et alia instrumenta. Ex metallo non uno sed pluribus fusa, non enim solum es daret tantam sonoritatem, nec solum calibs, sed illa et alia in fusione simul connexa.

[T]INTINABULUM est instrumentum metallorum, calibeum subtilissime calibs, quod percussum cum cambucella eiusdem metalli dat voces multum temperatas. Quod instrumentum habet se in modum strepis, inferius latum, superius vero gracilius. Ut quanto magis in sursum tendit, posset dare voces acuciores. Et istud instrumentum potest se com-

small bellows. It emits sounds by the touch of fingers [on keys] like the organ, differing from the organ in that it is smaller. It can be called a portative because it can be held in the hand, and it produces quieter sounds than the organ. He who knows how to play the organ will also know how to play this instrument, but not vice versa, for more [skills] are required for the organ than for the portative.

The virginal has the shape of a clavichord, and metal strings which produce the sonority of a harpsichord. It has thirty-two courses of strings [voiced] by striking the fingers on projecting keys, sounding sweetly in both whole-tones and semitones. It is called a virginal because, like a virgin, it soothes with a sweet and gentle voice.⁷

The *cymbalum* is a small bell with a little stone inside, divided in several parts to five species [of pitches?]. It adds the sweetest sounds to the lute and other instruments. It is not cast out of one metal but several, for copper alone would not yield such a sonority, nor steel alone, but [only] those and others joined by smelting.

The *tintinnabulum* [a type of bell] is made of metals, very finely wrought steel which produces quite agreeable sounds when struck with a small rod of the same metal. It has the shape of a stirrup: wide below, narrower above. The higher it is tuned, the higher the pitches it can produce. It can blend with all symphonic instruments, that is, with the lute, *nabulum*,

m. duos Reiss] duas

7. My translation of this definition owes much to that in Gustave Reese, *Music in the Renaissance*, rev. ed. (New York: W. W. Norton & Co., 1959), p. 667.

temperare cum omnibus instrumentis simfonicis, hoc est cum cithara, nablis, psalterio, dulce melos, clavicimbalo, et organis.

[C]ALCASTRUM est instrumentum plus trigonale quam quadrangulare, habens multas cordas nervalis per transversum latitudinaliter, super quod psaltes, cum digittis cordas tangens, perficit sue cantacionis intencionem. Oportet autem unguis huius instrumenti registrator laciores et aliquantulum acuciores habere ad huius instrumenti registracionem.

[I]NNPORTILE est instrumentum mire suavitatis, habens in uno dorso positivum, in alio vero cordas metallinas in modum clavicimbali, stans erectum in sursum in modum medie ale. Quorum utrumque una percussione ad clavos dat suas voces proporcionabiliter, se contemperans cum alio. Positivum autem habet suum follem, sed clavicimbalum suam ladulam, positiviⁿ percussione complens suas sonoritates.

[A]LA integra est instrumentum perfecti trianguli, sed media ala semitrianguli, habens cordas metallinas in sursum levatas, quam canora cum penna utraque manu sicut citharedus in cithara percuciens, perficit sue artis sonoritates melodia multum dulci. Et pauci sunt qui sciunt totam alam^o percutere, sed plures mediam solum.

[Y]SIS est instrumentum in modum rote, introrsus habens cordas

psaltery, dulcimer, harpsichord, and organ.

The *calcastrum* [a type of psaltery] is more triangular than square, and has many gut strings [stretched] across its width. The player executes the design of his song by plucking the strings with his fingers. One should have wide and somewhat pointed fingernails to play this instrument.

The claviorganum is an instrument of wonderful sweetness, having a positive in one case, and metal strings after the manner of a harpsichord (standing upright in the shape of a *media ala* [half psaltery]) in another. With one striking of the keys each of these yields its sounds proportionately, blending with the other. It has the bellows of a positive and the attack of a harpsichord, complementing the sonorities of the positive with percussion.

The *ala integra* [a type of psaltery] is an instrument [in the shape] of a perfect triangle, but the *media ala* is a semitriangle. Each has metal strings, strung vertically. The performer plays the sonorities of a very sweet melody, according to his abilities, by plucking the strings with a quill in each hand, as does the lutenist on the lute. There are few who can play the *ala integra*, but many who can play just the *media ala*.

The *Isis* [hurdy-gurdy] is an instrument in the shape of a bowed lyre. It

n. ladulam, positivi] l (?) *crossed out* ladulam portativi
o. alam *Mužiková*] aliam

nervales grossas et fortes, et rotam interius cum pice registratam, et exterius clavos certos,^p quos eciam canens registrat cum digittis. Ysis dictum, quoniam ab Ysi inventrice^q primitus est repertum. Quo instrumento communiter mulieres solent suum victum querere.

[T]UBALCANA est instrumentum ligneum intus concavum sicut monocordum trigonum, in cuius superficie transit corda nervalis magna quasi ad medium, et a medio tortuose alia in modum tube retorte. Et supra est corrigia, quam tubalcanator asseruit quasi pro manu altera. Et cum crinibus ducendo super eam facit precise sonum tube ut vult, sicut Sistrum.

[O]RMFA, que a vulgo dicitur Barbara, est instrumentum musicum habens tres fistulas et follem, quarum una fistula ab hominis ore dirigitur flatus in saccum coringialem. Et post replecionem sacci de spiritu humano, fit compressio sacci sub ascellis et registracio . . . [reliqua desunt]

has thick and strong gut strings inside, an internal wheel covered with pitch, and external fixed keys, which one depresses with the fingers while playing it. It is called the *Isis* because it was created by the inventress *Isis*. Women commonly used to seek their livelihood with this instrument.

The trumpet marine is a wooden instrument, hollow inside like a three-sided monochord. A large gut string passes over its surface to about the middle, and the remainder passes from the middle zigzag in the shape of a folded trumpet. At the top is a strap which the trumpet-marine player attaches to himself as if it were an extra hand. By drawing a bow over this [string], as [on] the [bowed] *sistrum*, he makes as precisely the sound of a trumpet as he wishes.

The bagpipe, which is called *Barbara* by the common folk, is a musical instrument consisting of three pipes and a bag. One pipe channels a stream of air from a man's mouth into an animal-skin sack. After the sack has been filled with human breath, a compression of the sack should be made under the armpits, and the fingering . . . [the rest is missing]

p. certos] o altered from e
q. inventrice] iñet^fce

Commentary

Musica instrumentalis: Paulirinus classifies musical instruments in five groups according to their mode of sound production:

1. Natural wind ("played by human breath")
2. Pitched percussion ("played by percussion alone")
3. Artificial wind ("played by the wind of bellows")
4. Artificial wind and pitched percussion ("played by wind and percussion")
5. Nonpitched percussion ("played by striking")

Conventional medieval classifications, following St. Augustine and Isidore of Seville, recognized only two instrumental types: wind and percussion. Some writers, following Boethius and Cassiodorus, added a third category, *tensio*, to account for the strings; but this group, unlike the others, did not differentiate on the basis of sound-producing means. Paulirinus expands Isidore's division by distinguishing between natural and artificial wind sources and between pitched and nonpitched percussion. A category combining wind and percussion was added to accommodate the claviorganum.

The lists of instruments illustrating these types do not include all those described in the ensuing text, nor does the classification itself appear to have dictated the order in which they are discussed. Representatives of the second, third, and fourth categories are treated in largely haphazard succession, but the first and fifth groups are not reached at all before the text breaks off. As a result, most of the examples associated with these latter types cannot be positively identified.

In addition there are a variety of apparent and real inconsistencies among the examples for each category which tend to obscure the distinctions among them. Paulirinus's list of natural winds consists of common biblical and other ancient names, but only *tuba* and *calamus* bore sufficiently standard connotations to be identified with confidence. Two names seem anomalous in application to winds. The *sambuca* (from Semitic *sabbekâ* via Greek *sambykē*) was a chordophone in antiquity, but Isidore of Seville confused *sambuca* with Latin *sambucus* ("elder tree") and defined the word as "a kind of

fragile wood, from which tibiae are made.”⁸ As a result, many medieval authors regarded it as a woodwind instrument: Jean de Gerson associated the name with a *doulcaine* in 1424, and in 1482 Ramos de Pareja applied it to a three-hole pipe.⁹ On the other hand, while *lyra* was quite flexible in connotation, it seems always to have been mentioned as some kind of stringed, not wind, instrument. Paulirinus’s intention is obscure.

Among the examples of bellows-blown instruments in the original text, the *Isis* (hurdy-gurdy) is clearly out of place. Fortunately we are given the additional information that it was “compressed under the armpits.” This phrase echoes Paulirinus’s subsequent description of playing the *ormfa* (bagpipe), which is obviously the instrument in question here. I have emended the text accordingly.

The manuscript also names the organ as sole representative of combined wind and percussion. But the organ, although it is struck on its keys, does not generate sound by percussive means, and in any case had already been classed among the purely bellows-blown instruments. Paulirinus’s fourth category makes sense only in terms of the *claviorganum*, and I have again made the necessary change.

Precisely what distinction Paulirinus intended between *percussio* (“percussion”) and *appulsus* (“striking”) is not clear. However, all but one of the examples cited for *percussio* are later defined individually, and may confidently be designated as pitched percussion. The *tympanum* is not mentioned again, but in this context it seems likely to have been some kind of tuned drum. The *sistrum* is unexpected here because it was originally a rattle sacred to the Egyptian goddess Isis (whence the name *sistrum*), but Paulirinus plainly identifies his *sistrum smiczecz* as a type of bowed lute. Jean Corbichon, writing in 1372, also considered the *sistrum* a lute, and Jean de Gerson classified it as a stringed instrument in his *Tractatus de canticis* (1426).¹⁰ Bowed strings (and the hurdy-gurdy) would have

8. Isidore of Seville, *Etymologiae* 3.21, trans. Oliver Strunk, *Source Readings in Music History* (New York: W. W. Norton & Co., 1950), p. 97.

9. Jean de Gerson, *Canticordum du pèlerin*, in *Jean de Gerson Oeuvres complètes*, ed. Mgr. Glorieux (Tournai: Desclée & Cie., 1960–73), 7: 128; Bartolomé Ramos de Pareja, *Musica practica*, ed. Johannes Wolf (Leipzig: Breitkopf & Härtel, 1901), p. 17.

10. Jean Corbichon, ed. and trans., *Le propriétaire des choses* by Bartholomaeus

been included in this category by regarding bowing and cranking as types of percussion, an outlook Gerson makes explicit: "Music with 'striking' may be made in three ways: by rotation as in the *symphonia*; by drawing back and forth [i.e., bowing] as on the *viella* or *rebella*; by beating or striking. . . ."11

If *percussio* covers all varieties of pitched percussion, it seems reasonable to surmise that *appulsus* should signify nonpitched percussion, but this supposition is not verifiable from the information supplied. The "struck-percussion sonority of metals" mentioned in the text cannot have been the primary distinguishing factor, since the *tintinnabulum*, defined as a bell struck with a metal beater, is classified as *percussio*. Neither are the examples given for *appulsus* of much help. *Rittonia* apparently does not occur elsewhere, and the word itself provides no clue to its meaning. *Nablum* (from Hebrew *nēvel*) is familiar enough, but as an ancient type of harp, which could hardly be expected to produce a struck-metal sonority. Although we do not know exactly what contemporary exponent Paulirinus had in mind, it is significant that in his definition of the *tintinnabulum* he listed the *nablum* as one of the "symphonic" instruments, in this context either polyphonic ones or those capable of playing at least a diatonic scale. But if it was any kind of pitched instrument, it is difficult to imagine what distinguished it from those in other categories. For several reasons, then, I am inclined to believe that it was another error to rank the *nablum* as *appulsus*, and to let stand the assumption that this category should represent nonpitched percussion.

Monochordum: It is evident that Paulirinus thought of the monochord in terms of its traditional function as a teaching aid, not as a musical instrument. Ancient Greek writers attributed the invention of the monochord and the system of musical intervals it demonstrates to Pythagoras, but medieval theorists acquired knowledge of both from Boethius and commonly cited him as their inventor.

Anglicus (Lyons, 1485), 19.144; Gerson, *Tractatus de canticis* (Glorieux ed., 9: 534), trans. Christopher Page, "Early 15th-Century Instruments in Jean de Gerson's 'Tractatus de canticis,'" *Early Music* 6 (1978): 348.

11. Gerson, *Tractatus de canticis* (Glorieux ed., 9: 594), trans. Page, "Early 15th-Century Instruments," p. 344.

Medieval monochords consisted of a gut string stretched between two fixed bridges over a hollow resonator. Calibrations indicating the desired string proportions were inscribed into the surface of the resonator and were often labelled with the letter-names of the resulting notes, as a guide for the placement of a moveable third bridge. The player stopped the string by pressing it into contact with the moveable bridge and plucked it with his finger or a plectrum. However, since Paulirinus says nothing about a moveable bridge, it is possible that he is describing a later type of monochord, which replaced one of the fixed bridges with a nut and lowered the other far enough so that the string could be stopped by pressing it directly into contact with the belly of the resonator. Other descriptions of such instruments are not found earlier than 1517.¹²

Clavichordium, clavicimbalum, and virginal: The clavichord and harpsichord were first mentioned as part of a list of instruments in Eberhart Cersne's *Minne Regel* (1404), and each was described and diagrammed in detail around 1440 by Henri Arnaut de Zwolle.¹³ This is, however, the earliest reference to the virginal. Curt Sachs speculated that this name was derived from Latin *virga*, used to mean "jack,"¹⁴ but Paulirinus demonstrates that the popular tradition associating the name with virgins goes back as far as our knowledge of the instrument's existence.

All three instruments had metal strings in courses of at least two per note, and the virginal seems to have had a fully chromatic range of two and a half octaves. The most interesting detail is the clavichord's

12. See Cecil Adkins, "The Technique of the Monochord," *Acta Musicologica* 39 (1967): 35.

13. Eberhart Cersne, *Minne Regel*, ed. Franz Xaver Wöber (Vienna: Wilhelm Braumüller, 1861), p. 24; George Le Cerf and E.-R. Labande, *Instruments de musique du XV^e siècle: Les traités d'Henri-Arnaut de Zwolle et de divers anonymes* (Paris: Éditions Auguste Picard, 1932), pp. 3-18.

14. Curt Sachs, *The History of Musical Instruments* (New York: W. W. Norton & Co., 1940), p. 335.

FIGURE 1. The twenty-four elders of the Apocalypse (Coburg, Landesbibliothek, MS.Cas.43, fol. III^f, dated 1448). The elders hold (top left to bottom right) clapper bells, triangle, recorder(?), jingles, folded trumpet, Gothic harp, shawm, waisted fiddle, lute, portative, dulcimer, gittern, mute cornett(?), artist's conception of a biblical cithara (based on illustrations of pseudo-St. Jerome), trumpet marine(?), vertically-strung psaltery, nakers, bell chime, vessel containing incense(?), clavichord, book of plainchant, clapper bell, and hurdy-gurdy.



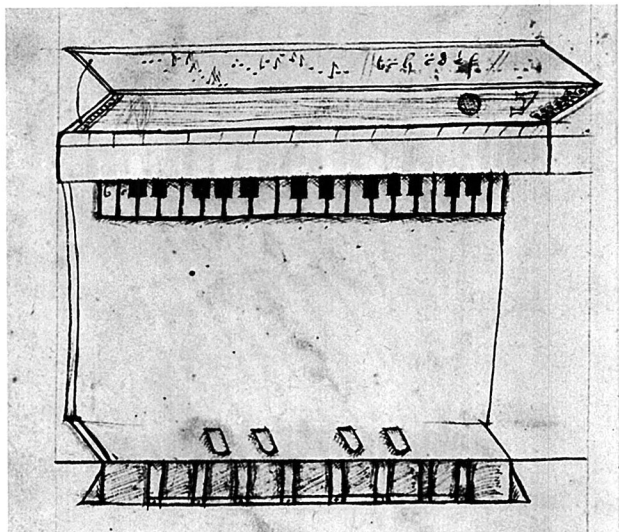


FIGURE 2. Earliest known drawing of a pedal clavichord (Stuttgart, Württembergische Landesbibliothek, Cod. poet. et phil. 4°52, fol. 65^v; the manuscript is dated 1464, but the drawing may have been added later).

pedalboard, which is mentioned here for the first time. A drawing of a pedal clavichord from a contemporary manuscript is shown in figure 2. A major function of the clavichord throughout its history was as a practice instrument for the organ, and, as Susi Jeans remarked, “any improvement of the organ keyboard, whether an increase in compass or the insertion of divided keys, was imitated on the clavichord from earliest times.”¹⁵ Paulirinus’s term for the pedalboard, *calcatorium*, means literally a “wine press” or “trampling place.”

Dulce melos: Oblong dulcimers played with sticks or metal beaters were common in the mid-fifteenth century (fig. 1), though Arnaut describes several varieties to which a keyboard was added.¹⁶ The quill

15. Jeans, “The Pedal Clavichord,” p. 8.

16. Le Cerf and Labande, *Instruments de musique du XV^e siècle*, pp. 19–24.

specified for use as a beater was probably "reinforced" by filling its hollow portion with some flexible substance. Paulirinus was not alone in his preference for the dulcimer's sonority; it was very popular among students at the University of Cracow in this period.¹⁷

Psalterium, calcastrum, ala integra, and media ala: Paulirinus supplies individual names for no less than four types of psaltery, distinguished by shape, string material and layout, and playing technique. Taken at face value, his descriptions yield the designs shown here in figure 3. We are given no information about the relative sizes of these instruments; moreover the shapes are not precisely defined. In view of Paulirinus's comparisons to harpsichord and wing (*ala*) shapes, it is possible that some or all of the diagonal sides in these drawings should be incurved.

Triangular psalteries resembling the *ala integra*—a "perfect" triangle would presumably be equilateral—make their first appearance among fanciful illustrations accompanying copies of the ninth-century *Epistle to Dardanus* by pseudo-St. Jerome,¹⁸ but many pictures showing this general outline survive from later times and in a variety of contexts, so we must accept it as a legitimate possibility. The only questionable detail here is its vertical stringing (cf. fig. 1). Sibyl Marcuse has argued that "vertical stringing from short to long and back to short does not make sense" and considers illustrations depicting this feature to be symbolic representations based on pseudo-St. Jerome.¹⁹ But Paulirinus's statement is unequivocal, and his treatise as a whole betrays no dependence on unreal symbolism. The curious string arrangement may account for Paulirinus's observation that the instrument was difficult to play.

Its "more triangular than square" shape probably indicates that the *calcastrum* was a trapezoid. For all practical purposes this design is not much different from that of the *ala integra*, but the *calcastrum* had normal horizontal stringing. Other factors distinguishing the two are the *ala integra*'s metal strings and plectrum playing technique, as

17. Nan Cooke Carpenter, *Music in the Medieval and Renaissance Universities* (Norman, Okla.: University of Oklahoma Press, 1958), pp. 279, 281.

18. See Christopher Page, "Biblical Instruments in Medieval Manuscript Illustration," *Early Music* 5 (1977): 299–309.

19. Marcuse, *A Survey of Musical Instruments*, p. 212.

opposed to the *calcastrum*'s gut strings played with the fingernails. The practice of growing long fingernails and sharpening them for playing plucked zithers is still current in eastern European countries.

A strict reading of Paulirinus's description of the *psalterium* would imply that it was made "in a triangular shape and sometimes [*interdum*] in a square shape," but the following phrase, "after the manner of a harpsichord," makes sense only if the triangular and square elements are combined. Consequently I have stretched the meaning of *interdum* to read "partly." If this interpretation is accepted, it would appear that the *psalterium* and *media ala* differed little aside from a minor variance in shape. Stringing was probably vertical on each (although this is not specified for the *psalterium*), and both were plucked with quills. Paulirinus's *media ala* is presumably not the Bohemian *ala* in use at the time, as no reference is made to that instrument's characteristic round pegbox.

Arfa: Medieval Latin musical treatises almost invariably use *cithara* to denote the harp. Having applied that term to the lute, Paulirinus resorted to a Slavic word, *arfa*, for his harp. Its wide dynamic range is explained in part by the specified fingernail plucking technique, which yields a more brilliant sound than playing with the tips of the fingers. Still more sound might have been generated if the pins used to fasten the strings to the bottom of the frame (sometimes called "bray pins") were set so that the strings rattled against them.²⁰

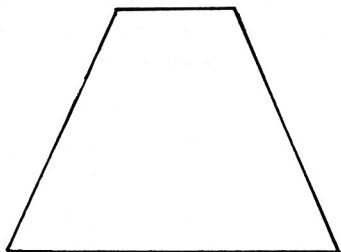
Cithara, sistrum smiczecz, and quinterna: *Cithara* was sometimes used as a generic term for any musical instrument, but most often it designated a harp. Paulirinus's application of the word to the lute is unusual, if not unique.²¹ Five double courses of strings were still common in the third quarter of the fifteenth century, although the top course was normally single, but a sixth course had been introduced in some areas and became standard by 1500. In his discussion of the *psalterium* Paulirinus remarks that the lute was played with a plectrum, which suggests that it was still employed as an essentially

20. See David Munrow, *Instruments of the Middle Ages and Renaissance* (London: Oxford University Press, 1976), p. 22.

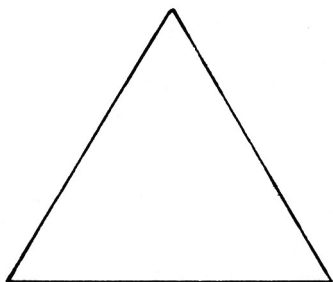
21. Other possible instances of this usage are discussed in David Fallows, "15th-Century Tablatures for Plucked Instruments: A Summary, a Revision and a Suggestion," *Lute Society Journal* 19 (1977): 31-33.



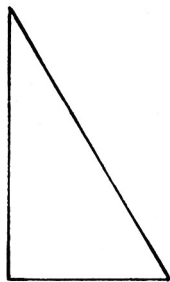
psalterium



calcastrum



ala integra



media ala

FIGURE 3. Psaltery shapes described by Paulirinus.

monophonic instrument. The extended simile between the lute and the human body is probably an amplification of a statement like Isidore's that "the form of the cithara was originally like that of the human chest, because it gives forth sound as the chest gives forth voice."²²

The *sistrum smiczecz* (*smyčec* is Czech for "bow") is defined as a bowed lute with one string. Ellen Hickmann has suggested that this

22. Isidore of Seville, *Etymologiae* 3.22, trans. Strunk, *Source Readings*, p. 98.

instrument may have been an ancestor of the modern Balkan *gusle* (or *gusla*), a long-necked Eastern lute with a concave back and one horsehair string, which is bowed.²³ Its name is traceable to the tenth century, and it is traditionally used to accompany recitations of epic folk poetry.

The *quinterna*, which must be translated "gittern" following Laurence Wright's revised terminology,²⁴ was a small lute, usually having four courses of strings in this period.

Organum and portativum: Paulirinus takes considerable care to distinguish between *cannae in modum fistularum*, reed "pipes" joined to conical or cylindrical resonating pipes, whose pitch is determined by the vibrating length of the reeds, and *fistellae*, flue pipes whose pitch depends upon the resonating length of their air columns. The distinction is an important one, for reed pipes were new to the organ in the fifteenth century, and resonators were not often added to them until about 1500.

Burdones, a Medieval Latin word meaning "pilgrim staves," was used to refer to tall bass organ pipes and, by analogy, to low registers on other instruments, especially drone strings and the drone pipes of the bagpipe. By the time Paulirinus was writing it was also applied to shorter organ pipes made to sound an octave lower by stopping their upper ends.

Paulirinus states that the portative is quieter than the organ, but it is noteworthy that he rated it a relatively loud instrument in comparing it to the harp.

Cymbalum and tintinnabulum: *Cymbalum* was the most common Latin term for a bell, although it was sometimes also applied to cymbals. Paulirinus unequivocally defines it as a *Nola parva*, a small bell. *Nola* is probably a diminutive form derived from *campana* (via *campanola*), which normally denoted a church bell. Most such bells were tulip-shaped, and Paulirinus's use of the word may indicate that his *cymbalum* had the same shape. The "little stone inside" is obvi-

23. Ellen Hickmann, *Musica instrumentalis: Studien zur Klassifikation des Musikinstrumentariums im Mittelalter*, Sammlung Musikwissenschaftlicher Abhandlungen, 55 (Baden-Baden: Verlag Valentin Koerner, 1971), p. 85.

24. Laurence Wright, "The Medieval Gittern and Citole: A Case of Mistaken Identity," *Galpin Society Journal* 30 (1977): 8-42.

ously a clapper, but the reference to some kind of manifold division is not at all clear. Perhaps multiple bells of differing pitch are meant, but the text seems to be slightly garbled here. The standard alloy for bells throughout the Middle Ages comprised 80 percent copper and 16–20 percent tin.²⁵

Tintinnabulum was less frequently used, but where it did appear it was invariably associated with bells. Nonetheless Růžena Mužíková identifies Paulirinus's *tintinnabulum* as a triangle, an interpretation based on Paulirinus's comment that the instrument "has the shape of a stirrup."²⁶ Mužíková points out that some medieval pictures show triangles with a trapezoidal shape, and she equates this with the shape of contemporary stirrups. However, a survey of fifteenth-century pictures of stirrups and photographs of surviving examples suggests that at this time stirrup shapes were not standardized; the sharp-angled trapezoid common earlier was gradually being superseded by increasingly hemispherical constructions. Trapezoids and even triangles do occur, but many have rounded upper corners, so that they more nearly resemble inverted cup shapes. Hemispheres and cup shapes are of course common bell designs. Hence Mužíková's identification on the basis of shape alone is possible, but not very likely.

Mužíková's assumption that the *tintinnabulum* was a triangle also influenced her translation of the next passage. Where I have given "... wide below, narrower above. The higher it is tuned, the higher the pitches it can produce," she reads, "it is thick at the bottom and thinner above. As you move from bottom to top [in striking it], it produces clearer sounds."²⁷ This interpretation is not impossible, but it ignores the common musical connotations of *tenere* and *vox* as "to tune" and "pitch." Moreover, a triangle of varying thickness would not differ in sound according to where it was struck, as the sound-producing vibrations would have to pass through its entire length. Finally, it may be noted that the *tintinnabulum* appears in the list of pitched percussion instruments in Paulirinus's definition of *musica instrumentalis*.

25. See J. Smits van Waesberghe, *Cymbala*, Studies and Documents, 1 (Rome: American Institute of Musicology, 1951), p. 17.

26. Mužíková, "Musica instrumentalis," pp. 104–5.

27. *Ibid.*, p. 93.

It seems certain, then, that both of these terms refer to bells. The *cymbalum* was a tulip-shaped clapper bell (probably hand-held), while the *tintinnabulum* was a hemispherical or cup-shaped bell struck with a metal beater, presumably part of a bell chime (cf. fig. 1).

Innportile: Paulirinus offers the earliest description of a clavorganum, and one of the few from any period which specifies that both its positive and upright harpsichord elements were to sound simultaneously. Mužíková has suggested that the name *innportile* was inspired by the instrument's immobility, in contrast to the portative.²⁸

Isis: The hurdy-gurdy and bowed lyre are compared because the most common type of each in the mid-fifteenth century featured a waisted shape (fig. 1).

Paulirinus's name for the hurdy-gurdy and his attribution of its invention to the Egyptian goddess Isis are unique and rather obscure. Our only clue to the basis for this association comes from his remark that it was frequently used by women. Marianne Bröcker has pointed out that in the wake of the Black Death, widespread warfare, and other disasters which decimated the male population of Europe in the fourteenth and fifteenth centuries, many women began playing musical instruments as a profession, most often the harp and hurdy-gurdy.²⁹ Hence it was not unusual for Paulirinus to have regarded the hurdy-gurdy as a women's instrument. And since Isis was traditionally the patron goddess of women, she was an appropriate subject for a legend concerning its origin.

Christopher Page contrasts Paulirinus's description of "thick and strong gut strings" with Jean de Gerson's likening of hurdy-gurdy strings to those of the harp, and he cites this conflict as "a warning against the easy assumption that medieval instruments of a certain type must have sounded alike."³⁰ In fact, however, Gerson's statement (*chordula nervorum prout in cithara*) compares the two kinds of strings only because they are both made of gut; they are not

28. *Ibid.*, p. 105.

29. Marianne Bröcker, *Die Drebleier: Ihr Bau und ihre Geschichte*, Orpheus—Schriftenreihe zu Grundfragen der Musik, 11 (Düsseldorf: Gesellschaft zur Förderung der systematischen Musikwissenschaft, 1973), 1: 400–404.

30. Page, "Early 15th-Century Instruments," p. 343.

necessarily the same in any other respect.³¹ He intends a reference back to his earlier discussion of the harp, where greater detail about gut strings was given.

Tubalcanna: Paulirinus is the first writer to distinguish clearly the trumpet marine from the monochord, and he provides the instrument with its first independent name. Its defining feature, a bridge with one leg shorter than the other, so that it was free to vibrate against the body of the instrument when the string was bowed, is not specifically mentioned. But the trumpetlike sonority characteristic of instruments possessing such a bridge receives its first notice here. *Tubalcanna* and German *Trumscheit* (first found in Virdung's *Musica getutscht* of 1511) are the only names the instrument had up to the end of the sixteenth century, when "trumpet marine" and its equivalents made their way into European vernaculars. Speculation on the origins of the latter name has aroused more interest than the instrument itself, since the trumpet marine is not a trumpet and has no discernible connection with the sea or mariners.

Tubalcanna is a compound. The *canna* element is explained by Paulirinus's definition of the trumpet marine as a "three-sided monochord"; he had already described the monochord as being "in the shape of a boat [*canna*]."³² *Tubal* is the biblical Jubal (often spelled *Tubal* in medieval sources), who is credited in Genesis 4:21 with the invention of music. Another version of music's origins was put forth by classical authors who told how Pythagoras, on passing a smithy, noticed that different sizes of hammers generated different pitches when struck on an anvil, and was inspired to work out a system of musical proportions. This conflict disturbed authority-conscious writers in the later Middle Ages, and some sought to resolve it in favor of the chronologically earlier Jubal by transferring the Pythagoras anvil legend to him.³³ In this hybrid version Jubal heard his brother

31. Gerson, *Tractatus de canticis* (Glorieux ed., 9: 534), trans. Page, "Early 15th-Century Instruments," p. 347.

32. According to Mužíková ("Musica instrumentalis," p. 107n.), Seidl derives the term from a combination of *Tubal* and *canere* ("to sing"), but this is grammatically impossible; *canna* (or *cana*, the spelling in the manuscript) is not a form of *canere*.

33. See James W. McKinnon, "Jubal vel Pythagoras, quis sit inventor musicae?" *Musical Quarterly* 64 (1978): 1-28.

Tubalcain, biblical ancestor of all smiths (Genesis 4:22), hammering in his smithy and was moved to experiment with the hammers himself.³⁴ Many late medieval paintings and sculptures portray Jubal as the symbolic representative and progenitor of music, either listening to the sound of hammers on anvils or wielding hammers himself. Hence a “Tubal-boat” (*Tubalcanna*) is by extension a “hammer-boat” or “drum-boat,” perhaps a reference to the hammering of the bridge’s shorter foot on the body of the instrument. Viewed in this way the term displays a considerable similarity to German *Trumscheit* (“drum-log”). And biblical symbolism, rather than merely a taste for exotic instrumental shapes, may also account for the trumpet marine’s great popularity in paintings of angel concerts and other religious subjects, which seems out of proportion to its likely utility in contemporary performances.

There may even be a distant ancestral relationship between Paulirinus’s name and the various forms of “trumpet marine.” If we assume that a term like *Tubalcanna* was known in the fifteenth century, it is possible that some musicians missed the connection with Jubal and associated the first half of the word with *tuba* (“trumpet”).³⁵ In that case *Tubalcanna* could have been read as “trumpet-boat,” which is easily transposed to the seemingly more logical “boat trumpet” and “marine trumpet.” This relationship must be regarded as highly speculative, since it is unlikely that Paulirinus’s treatise was widely known, and since forms of “trumpet marine” did not emerge for more than a century after he wrote. But if there is not enough evidence available to support a claim that “trumpet marine” stemmed from *Tubalcanna*, the very existence of Paulirinus’s term is enough to

34. *Tubalcanna* is not derived from Tubalcain, since medieval writers did not confuse the smith with his brother the musician. See Paul E. Beichner, *The Medieval Representative of Music, Jubal or Tubalcain?* Texts and Studies in the History of Mediaeval Education, 2 (Notre Dame, Indiana: The Medieval Institute, University of Notre Dame, 1954).

35. In a personal communication Professor Cecil Adkins, who is preparing a monograph on the trumpet marine with Alis Dickinson, raised the possibility that *Tubal* might be a degenerate adjectival form of *tuba*. I consider this derivation unlikely from a linguistic standpoint, but if correct it would make a connection between *Tubalcanna* and “trumpet marine” far more plausible.

suggest that after all there may have been a rational basis for the origin of the later name.

Unfortunately Paulirinus's Latin is exceptionally convoluted and obscure in this definition. The passage referring to one string, stretched straight as far as the middle (i.e., the bridge?) and zigzag from that point to the end, is particularly difficult. There seems no possible function for the zigzag portion of the string, and no such stringing is visible in any picture of the trumpet marine I have seen. Lacking further evidence, we must suppose that Paulirinus is describing a technical feature of the instrument which is otherwise unknown.

The strap mentioned is probably a shoulder or neck strap, which would have functioned to support the instrument "as if it were an extra hand." Such straps were common much later in the trumpet marine's history, but verbal confirmation of their existence in the fifteenth century is valuable support for the available iconographical evidence, which is ambiguous on this point.

Ormfa: As far as it goes this is an unexceptional description of a mouth-blown bagpipe with a blowpipe and presumably one chanter and one drone. Bags were normally made of sheep- or goatskin. I have been unable to trace either of the names Paulirinus applies to the instrument.

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Paulirinus's encyclopedia offers us the earliest descriptions of the virginal and trumpet marine, as well as a variety of other technical details. This record of firsts may seem remarkable for a treatise produced in Bohemia, but it would be a mistake to regard Paulirinus's work as a peripheral or provincial source. We have seen that he received a substantial part of his education in Italy, where most of these innovations are thought to have originated, and it is likely that his acquaintance with them dates from his sojourn there. Also, there is no particular reason to suppose that Paulirinus created any of the names he assigns to instruments, with the possible exception of the *sistrum smiczecz*. The fact that terms like *virginale* and *Tubalcanna* do not occur in other contemporary documents is no proof that they were not generally known. But it is important to realize that Paulirinus was not in Italy after 1440, twenty years before he wrote the *Liber*

viginti artium, and much of the new information he provides should probably be dated back that far. Bearing these considerations in mind, we can recognize Paulirinus as one of the most important commentators on musical instruments in the later Middle Ages.

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