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*Playbill*  
Spring 2004



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## **MAINSTAGE THEATRE \$5-\$14**

Presented in repertory, Chekhov's  
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*Bach & the North German Tradition* – March 7

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## **SCHOOL OF ART FREE**

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*Paintings by Pedro Alvarez* – Feb. 7 - June 19  
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*by Tran Trong Vu* – Feb. 7 - May 2  
*Humor, Irony and Wit: Ceramic Funk from*  
*the Sixties and Beyond* – Feb. 27 - June 5  
*The Long Day: Sculpture by Claudette*  
*Schreuders* – March 20 - June 19

## **INSTITUTE FOR STUDIES IN THE ARTS FREE**

*Miranda July* – screening of July's films,  
discussion of her work – Feb. 19  
*Inside Information* – visual translation  
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for a social cause – April 29

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# **MATHEMATICAL MUSIC: NUMBER IN THE CONCEPTION OF BACH'S ORGAN MUSIC**

*Kimberly Marshall, Organ*

School of Music  
Herberger College of Fine Arts  
Arizona State University

**February 22, 2004, 2:30 p.m.**

**Organ Hall  
Music Building**

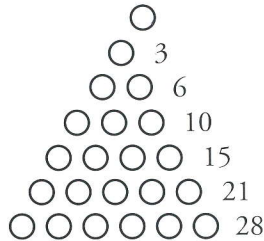
## PROGRAM

- Prelude in E-flat Major, BWV 552a . . . . . Johann Sebastian Bach  
(1685-1750)
- Adesto/Firmissime/Alleluia . . . . . Anonymous, *Robertsbridge Codex*, c. 1360
- Pavanne/Galliarde . . . . . published by Pierre Attaignant, Paris, 1531
- Pavana lachrimae . . . . . Jan Pieterszoon Sweelinck  
Fantasia chromatica (c. 1562-1621)
- Das alte Jahr vergangen ist, BWV 614 (*Orgelbüchlein*) . . . . . J. S. Bach  
Wir glauben all' an einen Gott, BWV 680 (*Clavier-Übung*, III)
- Passacaglia in D Minor, BWV 161 . . . . . Dieterich Buxtehude  
(1637-1707)
- Canzona in D Minor, BWV 588 . . . . . J. S. Bach
- Excerpts from *Fiori musicali*, 1635 . . . . . Girolamo Frescobaldi  
Canzona (1583-1643)  
Ricercar  
Bergamasca
- Fugue in E-flat Major, BWV 552b . . . . . Johann Sebastian Bach

## PROGRAM NOTES

Much has been made recently of the links between musical study and test scores in mathematics. This is no surprise to musicians, of course, because of the many links between the two disciplines. Musical intervals are aural reflections of mathematical proportions, and the pipe lengths of the organ are physical manifestations of these. In addition, every piece of music has a structure composed of metrical units that contain a certain number of beats. In today's program, we will explore the ways in which composers have manipulated musical meters and proportions, sometimes with symbolic intent.

Of great importance to musical numerology are the triangular numbers, derived from adding numbers in their natural order: 1, 1 + 2, 1 + 2 + 3, 1 + 2 + 3 + 4, etc. This creates a triangle, the simplest geometrical figure that can be made by joining lines:



The triangle symbolized the Divine for the ancient Greeks, and the Trinity for Christians. The triangular numbers were imbued with great significance, and they are reflected in nature, with 3 and 6 forming the basis of the duodecimal system (12 signs of the zodiac, 12 months of the year), and 10 the decimal system (10 fingers and toes on the human body). Several of the selections on today's program will demonstrate how these triangular numbers were incorporated into musical composition.

Mathematical proportions often govern musical structure and meter, where the speeds of various sections are calculated as proportions of a basic pulse, or tactus. Such proportional relationships are exploited in Frescobaldi's *Bergamasca*, while his *Canzona* presents a theme first in duple meter and then modified in triple meter. This proportional shifting between two and three is fundamental to much early music, as heard in the figures decorating the medieval motet, and in the *Pavanne* and *Galliarde* dances. Bach's E-flat Major Fugue features subdivisions in 2 and 3 that change between the 3 sections of the work. He also uses the old technique of hemiola to emphasize the half-point and conclusion of the second fugue. A hemiola shifts from 2 subdivisions of 3 to 3 subdivisions of 2, thereby adding one accent to each group of 6 beats and intensifying the cadence.

A ratio known as the Golden Section was used in classical art and architecture to create balance, and this too finds musical equivalents. In this proportion, a line is divided into two parts so that the ratio of the longer part (a) to the shorter part (b) is the same as the ratio of the entire segment (a + b) to the longer part:  $a/b = (a + b)/a$ . This works out to be about 1.618, and although musical structures cannot be so exactly measured, the *Fantasia* by Sweelinck and the *Ricercar* by Frescobaldi both introduce the contrapuntal technique of augmentation, where a theme is presented in long notes, at roughly this point in the work.

A mathematical relationship that Bach exploited was the numerical derivation of his name: B = 2, A = 1, C = 3, H = 8 BACH = 14. The careful study of his music reveals his mathematical “signature” in 14 entries of a theme, or a significant occurrence in the 14th measure of a piece. While this type of interpretation is purely speculative, it sometimes seems to explain particular features in Bach’s music and is very much in keeping with the arcane complexities of counterpoint.

The program is framed by Bach’s magisterial **Prelude and Fugue in E-flat Major**, BWV 552, the opening and closing works of his *Clavier-Übung*, Part III (1739). This was the first organ music that Bach published, and a close scrutiny of the score reveals numerical aspects related to his Lutheran faith. The complete *Clavier-Übung* III contains 27 pieces (3 x 3 x 3), perhaps mirroring the 27 books of the New Testament. The number 3, which represents the Trinity, is paramount to both the Prelude and the Fugue. The choice of E-flat major, a key with three flats, underscores the tripartite structures: the **Prelude** has three main textures while the **Fugue** is in three large sections. Musical characteristics also seem to reflect aspects of the Trinity. In the Prelude, the Father is represented by stately chordal sections with dotted rhythms in overture style. These alternate with galant echo effects (no pedal) to represent Christ, and contrapuntal treatment of a rapid theme that suggests the Holy Spirit.

Medieval theorists considered the number 3 to be complete, or “perfect.” Because of this, the earliest surviving polyphony was always subdivided into rhythmic units of 3, and it was not until a “new art” (ars nova) was introduced in the early 14th century, that subdivisions in 2 were explored. The keyboard arrangement of the ars nova motet **Adesto/Firmissime/Alleluia** demonstrates the repetitive use of triplet figuration, occasionally interrupted by pairs of notes in the new style.

In the spring of 1531, Pierre Attaingnant published seven small books of music in keyboard tablature, and these constitute the only French sources surviving from the Renaissance. The **Pavanne and Galliarde** were the most popular dances of the time, and sometimes the same musical material is treated in duple and triple meter, as in the example performed today. The Pavanne is a stately processional, while the Galliarde is robust, as its name implies, with a demanding choreography of jumps and turns.





Although Bach had no direct contact with him, the Dutch organist/composer Jan Pieterszoon Sweelinck was a seminal figure in the development of the north-German style. Major 17th-century organists such as Jacob Praetorius, Samuel Scheidt and Heinrich Scheidemann came to Amsterdam to study with Sweelinck, and upon returning to Germany, they applied his figurative contrapuntal style to the large organs over which they presided. The **Pavana Lachrimae** is an arrangement of John Dowland's famous song, "Flow my tears." The simple structure heard in the previous Pavane is expanded here, with embellished repetitions of the three main sections. The **Fantasia chromatica** is a marvelous work that is structured according to the Golden Section: at this point about 2/3 through the piece, Sweelinck introduces the descending chromatic subject in augmentation in the lowest voice. The theme is then developed in diminution and stretto, leading to a dramatic close. Sweelinck's ingenious keyboard figurations foreshadow those of Bach a century later.

**"Das alte Jahr vergangen ist"** (The old year has passed away) presents a concise numerical depiction of its subject, the calendar year. Despite its brevity, the piece is full of symbolism: it contains 12 bars, one for each month of the year; there is a rising motive of 6 semitones and a falling one that mirrors it, suggesting the changing seasons, and if you count the number of notes and symbols on the page, you arrive at 365, one for each day of the year.

**"Wir glauben all an einen Gott"** (We all believe in one God) is a fugal treatment of the chorale melody over an independent pedal motive that is 6 measures long and enters at different pitches 6 times during the piece. As shown above, 6 is a triangular number and has symbolic significance as the sum of the Trinity:  $1 + 2 + 3 = 6$ . It is also the first "perfect" number, where the number equals the sum of its factors. In this chorale setting, the number 6 may represent the six days of creation, to illustrate the continuation of the text, "Schöpfer Himmels und der Erden" (Creator of heaven and earth). The 14 entries of the chorale theme in the manuals may correspond to the numerical equivalent of Bach's name, suggesting a personal profession of faith.

Buxtehude's **Passacaglia in D Minor** may be based on the second "numerus perfectus," 28, which is the sum of its factors ( $1 + 2 + 4 + 7 + 14$ ) as well as of the first seven cardinal numbers ( $1 + 2 + 3 + 4 + 5 + 6 + 7$ ). The factors of 28 define the piece's structure, with two halves each containing 14 statements of the passacaglia theme, and 4 sections each with 7 statements.

The statements can be further subdivided into groups of 2 and 1. The Dutch organist Piet Kee goes even further with his interpretation to suggest that the number 28 also refers to the cycles of the moon, and that the 4 sections reflect the moon's phases as follows:

-  new moon (D minor, first presentation of theme)
-  first quarter (move to F major, intermediate point to A; addition of a 5th voice part)
-  full moon (A minor, with low pedal entries, full chords)
-  last quarter (return to D minor, waning intensity, triplet figures)

Bach's **Canzona in D Minor** may stem from his study of Italian forms, particularly the *canzoni* of Frescobaldi, which are based upon repeated-note themes, with lively imitation of short motives in all parts and a sectional form based on the change from duple to triple meter.

The excerpts from Frescobaldi's *Fiori musicali* reflect the early Italian style that Bach studied. The **Canzona** was intended to be played after the reading of the Epistle. Its lively style derives from the French chanson, a song containing spirited imitation of a repeated-note motive. Characteristic of the genre is the shift from duple to triple meter. A precursor of the fugue, the **Ricercar** (from the Italian verb "ricercare" meaning "to search out") is based on contrapuntal manipulations of a subject. Like Sweelinck, Frescobaldi introduces the subject in augmentation about 2/3 of the way through the piece, using the Golden Section to create a balanced structure. The **Bergamasca** is an exercise in metrical proportions, with each section featuring a different meter that must be calculated in relation to the others. Frescobaldi was well aware of this challenge to the performer, for he prefaced the piece with this remark: "Whoever plays this Bergamasca will not have learned little."

The **E-flat Major Fugue**, BWV 552, is a masterpiece of design and expression. The subject of rising fourths (identical to the first phrase of the chorale tune "O God our Help in Ages Past," although Bach would not have known it as such) is presented in three sections to symbolize the Trinity. The first section, a stately 5-voice Fugue depicts the Father; the second, where the chorale is combined with a running motive, the Son; and the third section, with its dense counterpoint and fiery pedal flourishes, the Holy Spirit. This work displays Bach's contrapuntal mastery, his ingenuity in treating simple themes and combining them with diverse countersubjects in different meters. The Fugue is an apogee in Bach's writing for the organ, transcending the techniques of composition to symbolize the divine.

— Kimberly Marshall

## BIOGRAPHY

**Kimberly Marshall** maintains an active career as a concert organist, performing regularly in Europe and the US. She presently holds the Patricia and Leonard Goldman Endowed Professorship in Organ at Arizona State University, having previously held teaching positions at the Royal Academy of Music, London, and Stanford University, California. Winner of the St. Albans Competition in 1985, she has been invited to play in prestigious venues and has recorded for Radio-France, the BBC, the ABC, and numerous American stations.



Dr. Marshall has been invited to play throughout Europe, including concerts in London's Royal Festival Hall and Westminster Cathedral; King's College, Cambridge; Chartres Cathedral; Uppsala Cathedral; and the Dormition Abbey in Jerusalem. She has also performed on many historical organs, such as the Couperin organ at Saint-Gervais, Paris, the Gothic organ in Sion, Switzerland, and the Cahmann organ in Leufstabruk, Sweden. Dr. Marshall especially enjoys tailoring programs to the styles of the instruments she plays, as is evident from her recordings of Italian and Spanish music on historical organs. Her playing is informed by research into obscure repertoire and knowledge of performance practice, although she does not limit herself to early music. While at Stanford, she gave performances of organ works by Ligeti in the presence of the composer, and during her time at the Royal Academy of Music she premiered a new work commissioned by Madame Messiaen. She is attracted to the organ by its vast possibilities of timbre and by the instrument's complex development since its invention in the third century BCE. Her work reflects this enthusiasm for musical creativity and historical awareness.

In 1986, Dr. Marshall received the D.Phil. in Music from the University of Oxford. Her thesis, *Iconographical Evidence for the Late-Medieval Organ*, was published by Garland in 1989. More recently, she has developed this work in several articles and lecture/presentations; a CD recording of the earliest surviving keyboard music is in press. She has lectured on her research for the American Musicological Society, the Berkeley Organ Conference, and the organ course in Romainmôtier, Switzerland. In recognition of her work, Dr. Marshall was awarded a Fulbright Scholarship to continue her research and teaching during 1991 at the Sydney Conservatorium in Australia. Northeastern University Press published her edition of articles on female traditions of music making, *Rediscovering the Muses*, in 1993, and she has contributed entries for the

*Grove Dictionary of Music 2000*. Her anthology of late-medieval keyboard music was published by Wayne Leupold in 2000.

Dr. Marshall's compact disc recordings feature music of the Italian and Spanish Renaissance, French Classical and Romantic periods, and works by J. S. Bach. Loft Recordings has re-issued a number of her recordings, including *Divine Euterpe*, works for organ by female composers, and *How Excellent is Thy Name*, Jewish liturgical music for cantor and organ. Dr. Marshall was a recitalist and workshop leader during four recent National Conventions of the American Guild of Organists (Dallas, 1994; New York, 1996; Denver, 1998; Seattle, 2000) She has been a Project Leader for the Organ Research Center in Göteborg, Sweden, where she teaches and performs frequently. During the summer of 2001, she appeared in Seoul for the Korean Association of Organists and in Toronto for the Convention of the Royal College of Canadian Organists. Her recording of Chen Yi's organ concerto with the Singapore Symphony was released last year on the BIS label. Her itinerary for 2004 includes appearances playing the famous Fisk organs at Stanford University and House of Hope Presbyterian Church, St. Paul, Minnesota; the newly restored Tannenberg organ in Old Salem, North Carolina; and the new dual-temperament Pasi organ in St. Cecilia's Cathedral, Omaha, Nebraska.

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