

Exotic Particles and the Confinement of Quarks

A Subatomic Fantasy for Wind Ensemble

for Ray E. Cramer and the Indiana University Wind Ensemble

Don Freund
2004

Duration: ca. 8 minutes Score is transposed.

Instrumentation:

Piccolo(s)
Flutes 1 & 2
Oboes 1 & 2
E^b Clarinet(s)
B^b Clarinets 1, 2, & 3
B^b Bass Clarinet(s)
B^b Contrabass Clarinet (parts also available for E^b Contra-alto Clarinet and String Bass)
B^b Soprano Saxophone
E^b Alto Saxophones 1 & 2
B^b Tenor Saxophone(s)
E^b Baritone Saxophone(s)
Bassoons 1 & 2

Bb Trumpets 1-4
Horns 1-4 (2nd "high", 3rd "low")
Trombones 1-4 (4th = Bass Trombone)
Euphoniums 1 & 2
Tubas 1 & 2

Piano/Celesta

Percussion 1-6:

Percussion 1
Glockenspiel (sounds 2 8ves higher), Xylophone (sounds 1 octave higher) [*may share with Percussion 2*],
Chimes [*may share with Percussion 4*], Large Tamtam

Percussion 2
Vibraphone, Xylophone (sounds 1 octave higher) [*may share with Percussion 1*],
3 Tuned Gongs (G³, B^{b3}, F^{#4}),
Small Suspended Cymbal, Brake Drum

Percussion 3
Marimba, Small Tamtam, Medium Hand Drum, Wood Block

Percussion 4
Crotales (2 octave set), Chimes [*may share with Percussion 1*],
Large Almglocke (F^{#4}), High Brake Drum, Slide Whistle,
2 Suspended Cymbals, Triangle

Percussion 5
3 Tomtoms, Slit Drum (2 pitches), Low Snare Drum, Bass Drum,
Small Suspended Cymbal, 2 Wood Blocks,
Small Tambourine, Large Tambourine, Large Cowbell,
Lion's Roar (ossia Bass Drum w/Superball mallet)

Percussion 6
3 Timpani G², B³, F^{(#)3},
Small Tamtam, High Bongo, Splash Cymbal (wood stick),
Ratchet, Claves, Police Whistle

Don Freund:

Exotic Particles and the Confinement of Quarks

A Subatomic Fantasy for Wind Ensemble

for Ray E. Cramer and the Indiana University Wind Ensemble

after the eponymous Distinguished Faculty Research Lecture by Alex Dzierba

Program Notes:

In April of 2004, Indiana University Physics Professor Alex Dzierba presented his Distinguished Faculty Research Lecture: *Exotic Particles and the Confinement of Quarks*. Within the proton's hot, bubbling cauldron of activity, quarks and glue move at nearly light speed and quarks and anti-quarks pop continuously in and out of existence. When pried even one proton's width apart (less than one trillionth the size of an atom), quarks experience ten tons of force pulling them together. Quarks are so small that we have not been able to measure their size; they take up less than one billionth of the space inside the proton. Particle accelerators can blast quarks out of a nucleus, but within much less than a billionth of a nanosecond "free" quarks join with newly created ones and brand new particles are formed. *

Now, thanks to the marvels of modern compositional technology, we are able to expand the world of the quark billions of billions of billions of times to produce an aural replica encompassing eight minutes of time and the space and sound range of a large wind ensemble. It is thus possible to hear evanescent particles come into being and disappear, massless neutrinos passing through, and even the moaning low brass of the confined quarks. We are amazed to discover that at this magnification one can even hear the passing of time in bits of a Morse code mantra that seems to take on a syncopated groove. At one point the violent batterings of colliding particles threaten to break this world apart but the superpowerful force of gluon surges to bring things back together.

The depictions and accounts presented in this work are solely those of the composer, and in no way is the IU Department of Physics responsible for their accuracy. Furthermore the Department of Bands cannot be held liable for any disfiguring of the listener's psycho-acoustic physiology created by the use of the lion's roar or androgynous C triads (with a quarter-tone third.)

Exotic Particles and the Confinement of Quarks was written in celebration of the tenure of Ray E. Cramer as IU's Director of Bands as he prepares for his retirement, which we suspect will be superactive, exotic, and wonderfully quarky.

*Paraphrased from a flyer provided by the Jefferson Lab (the Thomas Jefferson National Accelerator Facility.) Bona fide information about Alex Dzierba and his research can be found at <http://dustbunny.physics.indiana.edu/~dzierba/>

flutter (top note only)

Picc. *f p f p f p f p f p*

Fl1&2

Ob1&2 *1. solo p* *tutti mf p*

E♭Cl *ff* *solo* *mp* *tutti* *mp f pp fpp f pp*

1 *ff* *mp* *mp f pp fpp f pp*

2 *mp* *mp f pp fpp f pp*

3

B♭Cl

B♭CbCl

S Sax *fp fp fp fp fp fp*

ASx1&2 *1. solo fp fp fp*

TSx *fp fp fp*

BSx

Ba1&2 *tutti mf p*

1&2 *straight muted 1. solo p* *2. solo p cup muted* *3. solo harmoni used stem extended* *tutti open p* *35*

Bb Tpts *f* *p < mf* *p < f* *p < f*

3&4 *f* *p < mf* *p < f* *p < f*

Hns (F) *f* *mf*

1&2

3&4 *3. solo straight muted p < mf* *p < mf*

Euph *1. solo mf* *ossia: octave lower p* *mf*

Tb

Piano *f* *f* *f*

Pre 1 *f*

Pre 2

Pre 3 *mf* *ff* *p* *mf* *p < mf* *p < mf* *p < mf* *p < mf*

Pre 4

Pre 5 *snare off pp* *mp*

Pre 6

Picc. *tutti ff*

Fl1&2 *mf* *p* *mf* *ff* *f* *p*

Ob1&2 *mf* *p* *mf* *ff*

E♭Cl *ff*

1 *ff*

B♭Cl 2 *ff* *p* *f*

3 *ff* *p* *f*

Bs Cl *ff*

B♭CbCl *ff*

S Sx *tutti ff*

ASx1&2 *ff*

TSx *ff* *f* *p*

BSx *ff*

Bn1&2 *mf* *p* *mf*

1&2 *mf* *p* *f* *tutti open*

Bb Tpts *f* *tutti open*

1&2 *ff* *open* *ff* *f* *mf* *p* *mp* *p* (foreground) half-stop to B 1/4-tone flat

3&4 *ff* *open* *ff* *f* *mf* *p*

1&2 *open* *open ff* *ff* *f* *ff*

Tn *ff* *ff* *f* *ff*

3&4 *ff* *ff* *f* *ff*

Euph *tutti* *ff* *f* *ff* *p*

Tb *ff* *ff* *f* *ff* *p*

Piano *ff* *p*

Pre 1 **Glockenspiel** *ff* **Largo Tamtam** *ff* *scrape rim with triangle beater* *mf*

Pre 2 **Vibraphone** *p* *ff* **Vibraphone** *p* *mp* *p*

Pre 3 **Marimba** *mf* *ff* **Marimba** *p* *mp* *p*

Pre 4 **Triangle** *p*

Pre 5 **Small Tambourine** *shake* *ff*

Pre 6 **Timpani** *ff* *f* *ff* *p* *pp*

E 1/4-tone flat

Picc.

Fl1&2

Ob1&2

E♭Cl

1

2

3

B♭Cl

Bs Cl

B♭Cl

S Sx

ASx1&2

TSx

BSx

Bn1&2

67

72

flutter 3

tutti

f

p

mf

p

p

f

p

f

p

E 1/4-tone flat

1&2

3&4

Bb Tpts

1&2

3&4

Hns (F)

1&2

3&4

Tn

Euph

Tb

67

72

flutter

open

p

mf

p

Piano

mp

p

mp

p

mp

p

mp

p

f

(Chimes)

Pre 1

(Vibraphone)

Pre 2

Pre 3

Pre 4

Pre 5

Pre 6

Small Tamtam

hard yarn mallet

mp

Large Suspended Cymbal

scrape with triangle beater

mf

mf

Small Susp. Cymbal

mf

mf

Picc. *ff, staccatissimo* *ff*

Fl1&2 *ff, staccatissimo* *ff*

Ob1&2 *ff, staccatissimo* *ff*

E♭Cl *ff*

1 *ff*

2 *ff*

3 *ff*

Bs Cl *ff*

B♭/CbCl *ff* *p*

S Sax *ff, staccatissimo* *ff* *ff* *ff*

ASx1&2 *ff* *p*

TSx *ff* *p*

BSx *ff* *p*

Bn1&2 *ff* *p*

1&2 *ff*

3&4 *ff*

Hns (F) *ff*

1&2 *ff*

3&4 *ff*

Ta *solo cup muted E 1/4-tone flat* *p* *mf* *p*

Euph *f* *p*

Tb *f* *p*

Piano *Colenta* *f*

Pr1 *p*

Pr2 *p*

Pr3 *Marimba* *p*

Pr4 *mf*

Pr5 *Wood Blocks* *hard rubber mallets mf (match winds)* *mf* *mf*

Pr6 *mf*

111

115

Picc. *f* *mf*

F11&2 *f* *mf*

Ob1&2

E♭Cl *(flowing)* *p* *f* *f* *mf*

1 *p* *f* *f* *mf*

2 *p* *f* *f* *mf*

3 *p* *f* *f* *mf*

B♭Cl

B♭CbCl

S Sax

ASx1&2

TSx

BSx

Bn1&2

111

115

1. solo *p* *half-valve gliss.* *f* *f*

open *2. solo* *mf*

open

Bb Tpts *f* *mf*

3&4 *f* *mf*

1&2

Hns (F) *f* *mf*

3&4

1&2

Tn

3&4

Euph

Tb

Celesta *f* *ff*

Pre 1 *(Xylophone)* *p*

Pre 2 *Brake Drum* *hard plastic mallet* *f* *f*

Pre 3 *(Marimba)* *p*

Pre 4 *(Crotales)*

Pre 5 *(Wood Blocks)*

Pre 6 *Police Whistle* *f*

Picc. *ff* (solo) *ff*

F11&2

Ob1&2 *sfz*

E♭Cl *ff* (solo) *ff*

1 *sfz*

2 *sfz*

3 *sfz*

B♭Cl

B♭CbCl

S Sx *sfz*

ASx1&2 *sfz*

TSx

BSx

Bn1&2 *sfz*

1&2 *f* **136** **139** *f* *tutti*

Bb Tpts

3&4

1&2

Hns (F) *f*

3&4

1&2

Tn

3&4

Euph *mf*

Tb *mf*

Piano

(Xylophone)

Pre 1

(Gong) *mf*

Pre 2

Medium Hand Drum *mf*

Pre 3

Crotales *mf* held in the air with one hand and struck with the other (ritualistic visual effect)

Pre 4

Small Susp. Cymbal *mf*

(Slit Drum)

Pre 5

(Timpani)

Pre 6 *mf*

Picc.

F11&2

Ob1&2 *tutti*
f

E♭Cl

1

2

3

B♭ Cl

B♭ Cl

S Sax

ASx1&2

TSx

BSx

Bn1&2 *tutti*
f

1&2

3&4

B♭ Tpts

143

149

Brass repeated notes very legato, rich, full-toned

Horn 1 open to half-stopped
B 1/4-tone flat

Horns 2, 3, 4 *p*
stopped

1&2 *f* *mf* *f* *ff*

3&4 *f* *mf* *f* *ff*

1&2 *mf* *f* *mf* *f* *ff* *pp*

3&4 *mf* *f* *mf* *f* *ff* *pp*

Euph *mf* *f* *mf* *f* *ff* *pp*

Tb *mf* *f* *mf* *f* *ff* *pp*

Piano *mp*

Glockenspiel *p*

Vibraphone *p*

Almglocke *soft rubber mallets mp*

Bass Drum *pp* *f*

Pr 5

Pr 6

155

163

Picc. *p* E 1/4-tone flat

F11&2 *p* E 1/4-tone flat 3 solos *mp no vibrato*

Ob1&2 *p* 1. solo *mp (solo)*

E♭Cl *pp < f >* C 1/4-tone sharp

1 *pp < f >*

2 *pp < f >*

3 *pp < f >*

B♭Cl

B♭S Cl

B♭C♭Cl

S Sx

ASx1&2 *p*

TSx

BSx

Bn1&2 1. solo *mp (solo)*

155

163

1&2 *pp < f > pp* tutti practice muted

3&4 *pp < f > pp* tutti practice muted

Hns (F)

1&2 1. solo *pp < f > pp* practice muted E 1/4-tone flat

3&4

Euph

Tb

Piano *p < mp*

Pre 1 ¹³ (Glockenspiel)

Pre 2 (Vibraphone)

Pre 3

Pre 4 (Atmglöcke) *p < mp* **Chinese** fiberglass hammer *no pedal mp*

Pre 5

Pre 6