

The ATLATL

SUMMER 1989

VOL. 2 No. 2

THE NEWSLETTER OF THE WORLD ATLATL ASSOCIATION, INC.
1191 NUCLA STREET, AURORA, COLORADO 80011, USA

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THE WEIGHTED ATLATL AND DART: A Deceptively Complicated Mechanical System. COPYRIGHT © 1989 by BPS Engineering

by
WILLIAM R. PERKINS
and
PAUL LEININGER

In the fall of 1984, under the direction of Dr. Tom Roll, as engineering students at MSU, we began an investigation into the atlatl and dart system while taking a course in replicative archaeology. What began as a class project led to five years of research into an intriguing and sometimes obsessive problem in our field of study. We found that the underlying technology of this seemingly simple ancient projectile launching device is impressive even by today's standards.

Information from the few papers on the subject available to us at the beginning of our experiments generally reflected the same conclusions as all the papers we have thus far accumulated, which is: there has been no conclusive evidence that explains the purpose of

atlatl weights, and because this weapon was used by man for such an extended period of time, as indicated by archaeological evidence in North America, experimental performances of atlatl replications seem very inefficient. The sheer longevity of the original weapon suggested to us that it had to be superior in performance to what was being reported in tests and scientific papers.

Although many experimenters have reported extensively the various dimensions, masses, and other details of their versions of the atlatl, the projectile itself is only briefly mentioned as to the number of meters it will travel. In discovering that this important aspect of the atlatl system had been largely neglected, the obvious direction in our experiment aided now by 20/20 hindsight, was the intense investigation of the dart alone.

The atlatl has often been referred to as a spear thrower and this idea interfered directly with our trials until we discovered that it is nothing of the kind. Spears are meant to be propelled directly by hand. They are generally long, rigid, and massive (at least several hundred grams) in order to

deliver a heavy impact at the low velocities obtained by the arm alone. The tip of the atlatl is capable of going much faster than the hand, consequently, the projectile must have the length of a spear, but also be light and flexible. These are characteristics of the dart. The atlatl is therefore, a dart thrower. The energy required to throw the dart is provided by the arm, as for a spear, but the extension that the atlatl creates combined with the light weight and flexibility of the dart allows for greater speed and distance.

In addition to its light weight and resiliency, the dart differs from the spear in the application of force used to propel it. To launch a spear, the energy originates somewhere in the middle, where it is grasped by the hand. The dart, however, achieves its momentum only by a push at the rear end of its shaft. This mode of propulsion allows a flexible dart to be a mechanical wave medium capable of oscillating potential and kinetic energy under acceleration.

The ability to flex and propagate transverse waves is critically important for the dart in the weapon's design, and suggests a close relationship to the arrow in the bow and arrow system. Modern archers realize that when they loose an arrow, that arrow flexes and literally wraps itself around the arrow rest and springs off. To make this work properly, timing must be just right. the mechanical wave must be at the right position when force loses contact. For this reason, an

archer consults a chart that combines draw length (arrow length) with the force of the bow at this draw length to determine the size of shaft required. To make the arrow properly "spined," an arrow shaft manufacturer might make 20 different stiffnesses of shafts.

How significant to performance is the use of any particular arrow? We have not experimented with any bows and arrows to speak of, but the arrow manufacturers assert that if an arrow is not spined properly it will not be pointed quite straight when it exits the bow. This will cause it to climb or dive slightly as it plows through the air. Archers tell us that the right arrow can refine the system by producing a smoother release and more consistency between target and aim. The degree of flexibility of an arrow mainly affects the accuracy of the system, but an improperly spined arrow will still be released and travel down range, however inefficient it may be.

The degree of flexibility of the projectile affects the bow and arrow system, but it does not determine whether or not it will function. However, the flexibility of the dart is critical to the operation of the atlatl and dart system. Under acceleration by the atlatl, the dart bends and recoils, pushing away from the atlatl and accelerating itself to a slightly greater velocity. Without the ability to flex, a dart would remain in contact with the atlatl throughout the latter part of the swing, and would only launch when the atlatl decelerates drastically

or slips off as the atlatl continues in a downward direction at the end of the swing, an effect known as "kickdown," which is produced from a dart remaining in contact too long with the atlatl. Because of the curved trajectory that the atlatl spur (place of contact between the end of the dart and the atlatl) follows, it is very important that the dart accelerate away from the atlatl before the spur curves downward. This is of no concern when using the bow and arrow because the bowstring is always pushing forward and never downward.

PART II OF THIS WORK WILL BE PUBLISHED IN THE FALL ISSUE OF "THE ATLATL."

MUSEUM DISPLAYS OF THE ATLATL, (1989)

BY
CHARLEY LILLY

Maxwell Museum, University of New Mexico. Albuquerque, NM 87131 (Bernalillo Co.) (Contains one atlatl and dart fragment plus a reproduction of an atlatl).

Northern Arizona University, Flagstaff, AZ 86011 (Coconino Co.) (Atlatis).

Poverty Point Museum, Epps, LA 71237 (West Carroll Par.) (Demonstrations made with reproduction of atlatl).

Museum at Lajitas, TX 79852 (Brewster Co.) Located west of Big Bend National Park on the Row Grande River. (Atlatl weight and a reproduction of an atlatl).

Dan O'Laurie Museum, Moab, Utah 84532 (Grand Co.) Eastern Utah, south of Arches National Park. (Atlatl reproduction).

Anasazi Heritage Center, Dolores, CO 81323 (Montezuma Co.) North of Cortez, northeast of Mesa Verde National Park. (Atlatl reproduction).

Ute Pass Museum, 8015 State Hwy. 24, Cascade, CO 80809, (El Paso Co.) West of Colorado Springs. (Projectile points with atlatl reproduction).

Lost City Museum, PO Box 807, Overton, NV 89040 (Clark Co.,) Open 8:30 AM to 4:30 PM, located on State Highway 12, 60 miles northeast of Las Vegas, just east of Valley of Fire State Park. Note that there is a petroglyph of atlatl at the park. (Atlatl reproduction).

Henderson Museum, University of Colorado at Boulder, CO 80309 (Boulder Co.) (Earl Morris collection from Canyon del Muerto in Canyon de Chelly, with one atlatl on display and one in storage).

Denver Museum of Natural History, 2001 Colorado Boulevard, Denver, CO (Denver Co.) (Reproduction on display).

Museum of Anthropology, Mexico City, Mexico. (Reproductions and originals on display).

READERS ARE ENCOURAGED TO SEND US ADDITIONS TO THIS LIST!!!!

"ATLATLS IN THE
QUAKIES"
THE COLORADO
ARCHAEOLOGICAL
SOCIETY FOURTH
ANNUAL ENCAMPMENT

The Chipeta Chapter, under direction of past CAS President Bill Harris played host to over a hundred campers for the Colorado Archaeological Society Annual Encampment. This was the fourth such event, each has been held in different camp grounds in early July. Silver Jack campground proved to be a beautiful restful site on which to hold the event amid the quaking aspen trees and high mountain scenery. The only noise aside from the wind rustling in the trees was cheering for the atlatlists competing for prizes. Thirty-three contestants vied for the coveted "CAS Greatest Honor" award. Results of the July 1st contest are as follows:

MEN'S DIVISION

1. Paul Leininger, Montana
2. Bob Perkins, Montana
3. Boney Cosyleon, Pueblo Chapter CAS

WOMEN'S DIVISION

1. Fran Cosyleon, Pueblo Chapter, CAS
2. Jennifer Galindo, New Mexico
3. Anna Cosyleon, Pueblo Chapter, CAS

16 AND UNDER

1. Dan Luttrell, Texas
2. Gabe Cosyleon, Pueblo Chapter, CAS
3. Erika Mohr, Royal Gorge Chapter, CAS

10 AND UNDER

1. Eva Cosyleon, Pueblo Chapter, CAS
2. Jennie Oton, Pueblo Chapter, CAS
3. Christen Cunnington, New Mexico

CAS GREATEST HONOR

Boney Cosyleon, Pueblo Chapter

FREE-FOR-ALL
MODERN OR PRIMITIVE EQUIPMENT
ANY-THING-GOES ATLATL CONTEST

Gabe Cosyleon, Pueblo Chapter

INDIAN GAMES, 12 AND UNDER

1. Travis Jackson, Chipeta Chapter, CAS
2. Jennie Oton, Pueblo Chapter, CAS
3. Jamie Deltonto, Chipeta Chapter, CAS



FIRST, SECOND AND THIRD PLACE WINNERS OF THE MEN'S, WOMEN'S AND 16 AND UNDER DIVISIONS. Back row, L-R, BOB PERKINS, PAUL LEININGER, ERIKA MOHR, JENNIFER GALINDO, DAN LUTTRELL. Front row, L-R, FRAN COSYLEON, BONEY COSYLEON, GABE COSYLEON, ANNA COSYLEON



BONEY COSYLEON sports his prize winning smile after taking the 1989 CAS Annual Encampment Greatest Honor Award.

In looking over the list of winners at the Colorado Archaeological Society's Encampment atlatl contest, one cannot help but notice the Cosyleon name cropping up again and again. The Cosyleons live just outside of Pueblo, Colorado on a small acreage--large enough for atlatl practice I suspect.



PRIZE WINNING FAMILY. Behind EVA COSYLEON, stand Gabe, Fran, Boney, and Anna. Each, won a first, second or third place prize in addition to Gabe winning the Free-For-All and Boney capturing the "Greatest Honor Award."

 CAN YOU IMAGINE... BEING TRIED
 BY 12 MEN AND WOMEN WHO AREN'T
 SMART ENOUGH TO ESCAPE JURY
 DUTY?

ANNUAL BUSINESS MEETING NEWS

Among the business conducted at the annual business meeting of the World Atlatl Association was election of Officers. New WAA officers are:

PRESIDENT: LENI CLUBB of Ocotillo, California.
 VICE PRESIDENT: BILL TATE of Aurora Colorado.
 SECRETARY: CHARLEY LILLY of Carbondale, Colorado.
 TREASURER: DOUG BOWMAN of Dolores, Colorado.

BOARD OF DIRECTORS:
 TIM BOUCHER Dillon, CO
 SCOTT LESLIE, Carbondale, CO
 BARBARA SNOBBLE, Carbondale, CO
 NEW MEMBERS:
 BOB PERKINS, Manhattan, MT
 KEN "RED" GRAMSTAD, Ocotillo, CA.
 BILL TATE will continue as Newsletter Editor.

Additional business was discussed including the hotly debated subject of "Primitive vs. modern equipment." It was decided that the WAA should not try to regulate the type of weaponry to be used in any contest. This decision should remain with those holding the event. We should, instead, work toward regulating safety at atlatl contests.



New WAA President: LENI CLUBB.

**MONTANA ATLATL
EVENTS**

**FIRST ANNUAL
MONTANA ATLATL
MAMMOTH HUNT**

Manuel White

TIME: 11:00 AM Saturday, Aug.
26, 1989

PLACE: 3212 York (or Lori)
Road, Helena, MT 59604

SPONSORS: Manuel White
Helen White
Bob Perkins
Dave Schwab
Diane Schwab

AWARDS: Beautiful trophies for
the top three finishers in each
division.

DIVISIONS: Adult Men
Adult Women
Children under 16

TARGET: Eight foot mammoth and
bison replicas.

RANGE: Adult Men - 75, 60, 40,
and 20 meters.

Adult Women and under
16 group - 60, 45, 30, and 15
meters.

Three spears at each range with
point scoring system.

ENTRY FEE: \$10.00 Adults,
\$5.00 under 16. Fee includes
barbecue. Register on arrival.
Non profit.

OTHER FEATURES:

1. Flight shoot for distance
only and for each division.
2. Bacon shoot at 20 meters
with one dart.
3. Atlatl exhibits.

EDITORS NOTE: LOOKS LIKE FUN!

**1988 MONTANA
CONTEST**

Manuel White

The First Annual Montana State
Atlatl Championship was held
October 1, 1988 at David and
Diane Schwab's place in Helena,
MT. Using a plywood mammoth
target, three darts were thrown
from 70, 55, 40 and five darts
from 20 yards for men. The
women and youth under 15 years
of age threw from 40, 30 20 and
15 yards. A hit with the first
dart netted the contestant 15
points. A second dart hit
brought in 10 points, and 5
points were gained by a hit
with the third dart cast.

Winners of the event were:

DIANE SCHWAB Women
MANUEL WHITE Men

Additional contests were held
for "Precision" throwing, five
darts at the same target, and
a distance throw. The winning
distance was 375 feet.

The officials for these games
were Bob Perkins and Paul
Leininger.

**OTHER MONTANA
ATLATL EVENTS**

The Summer Solstice Montana
State Atlatl Championship was
held June 17th, 1989. Again,
Dave Schwab played host to a
gathering of atlatl enthusiasts
as they not only held atlatl
contests, but filled a weekend
of events, including a potluck
roast pig dinner, story
telling, and music. Even a hot
tub and sweat lodge were
available to guests.

FIRST ANNUAL
EASTERN SEABOARD
ATLATL
CHAMPIONSHIPS

As we go to press with this issue of "THE ATLATL," The big eastern event is underway. The planned contest is to take place on July 29th, 1989 at 11:00 AM. The Championship Match scheduled is 6 shots from 15 or 20 yards, then 3 shots each at 40, 60 and 70 yards. Trophies go to the top three finishers in both men's and women's divisions. Trophies are being provided by BPS Engineering. The top three finishers in both divisions will meet for a Grand Championship prize. Additional contests will include a Distance throw, and a Closest-to-the-Pin throw.

The following are excerpts from letters received from Manuel White, "an incurable addicted atlatler," to use his terms.

"Having been addicted to the use of the atlatl since buying one manufactured by BPS Engineering, I wish to share my experiences with you. Dave Schwab was very helpful in showing me how to use this truly remarkable throwing implement which takes us back to the Stone Age."

Running a series of tests with various bows to propel atlatl darts and comparing the results with the BPS atlatl, Dr. White goes on, "It takes a 70 lb. compound bow, or a good 70 lb. laminated fiberglass recurve to match the cast or distance that a good thrower can get using the atlatl and dart!"

"It has also been my experience that the person most likely and best adapted to atlatl throwing success is a good javelin thrower, an exceptional fly caster, strong baseball pitcher, or a good football quarterback with exceptional football passing ability. The approach and overhand throwing technique as well as follow through are essentially the same." Manuel goes on to state that he is an experienced javelin thrower.

"Additional testing has been more recently completed with interesting results."

"A 100 lb. draw crossbow propelled a 2419 XX75 aluminum 70 inch long dart a maximum distance of 295 feet. The same dart has been hurled 424 feet with a 27 inch BPS factory made atlatl. The same distance was achieved using a 29 inch laminated home made atlatl made by me."

"A PSE 2 wheel composite limb compound bow set at 75 lbs. draw weight, achieved 429 feet maximum distance with the same dart."

"As would be expected, the results of penetration into a vinyl covered styrofoam target using the 2419 dart as well as regular 2419 arrows, and using the BPS atlatl and homemade atlatl were essentially the same--eight to nine inches penetration. Razor-sharp hunting broadheads could easily penetrate deeper."

"These findings support Dr. G. Frison's contention that the ancient Clovis man could have successfully hunted the mammoth with the use of the atlatl."

"Further experiments and tests actually performed by me show that the use of a good atlatl can enable one to throw the same dart or spear three times farther when compared to bare-handed throws as with a javelin."

"A good atlatl in the hands of an expert, with a strong throwing arm, can successfully hunt big game. I personally see no reason why the atlatl should not be approved as a legal primitive hunting implement. A good atlatl with good darts topped with sharp broadheads is as lethal as a heavy bow or crossbow."

Manuel has issued an invitation for the 1990 or 1991 Atlatl World Open to be held in Montana on his 12 acre site.

We thank Dr. White for all the information above. It is tests such as these which explain just how effective this weapon really is. Keep up the good work. We need more experiments and tests such as these.

**1989 ATLATL WORLD
OPEN ATLATL
CONTEST**

Wyoming's 1989 World Open Atlatl Contest is scheduled for August 19th at Fort Caspar Museum in Casper, Wyoming. The event will feature an Arts and

Crafts Fair, the Atlatl contest, and an evening speaker. All Flintknappers and other demonstrators are welcome and encouraged to attend.

**PROFESSIONALS BUILT THE TITANIC,
AMATEURS BUILT THE ARK.**

ADVERTISEMENT

10% DISCOUNT

WAA members receive 10% discount on their purchases from the following firms manufacturing atlatls and related equipment:

TATE ENTERPRISES UNLIMITED, INC., P. O. Box 110755, Aurora, CO 80011, phone (303) 364-0059
Contact Tate Enterprises for information on their "SpearChucker" kits and readymade equipment and instructional information.

BPS ENGINEERING, Box 797, Manhattan, Montana 59741, phone (406) 284-3307.

BPS Engineering is the maker of the "Mammoth Hunter", "Warrior" and other fine atlatls and darts. Call or write for more information.

NOTICE

IT'S ANNUAL DUES PAYING TIME FOR MOST MEMBERS!

INSURE CONTINUED RECEIPT OF THE ATLATL

**THE WORLD ATLATL ASSOCIATION
MEMBERSHIP APPLICATION**

DUES: \$10.00 PER YEAR

NAME _____

ADDRESS _____

CITY/STATE/ZIP _____

PHONE _____

APPLICATION
OR
RENEWAL

\$ _____ AMOUNT ENCLOSED

MAKE CHECKS PAYABLE TO THE WORLD ATLATL ASSOCIATION, INC.
MAIL TO 8800 STATE HIGHWAY 133, CARBONDALE, COLORADO 81623, U. S. A.