The ATLATL

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PART III

THE WEIGHTED ATLATL AND DART: A DECEPTIVELY COMPLICATED MECHANICAL SYSTEM.

by
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and
Paul Leininger

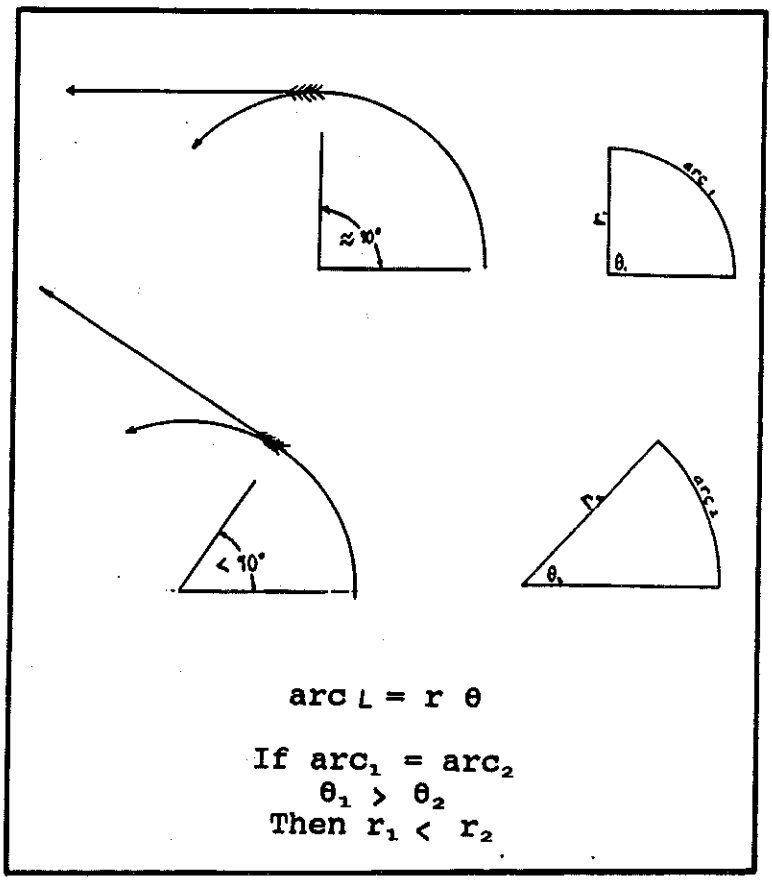
The law of diminishing return applies to the weighted atlatl and dart system. A properly tuned dart yields about 80% of the effectiveness with approximately 20% of the technology. In other words, a finely tuned dart will function with any atlatl, but the best atlatl in the world won't propel an untuned dart efficiently enough to be effective.

A weighted atlatl can be designed to match mechanically with a properly tuned dart. The system can be compared to a mathematical equation with the dart on one side of the equal sign and the atlatl on the other. With the dart side of the equation known, the atlatl side is more easily solved.

Neglecting structural mass, the measurable quantities of the dart are length and flexibility, with additional mass loaded onto it in order to improve its efficiency. Again, disregarding structural mass, the weighted atlatl also has the same measurable quantities. Both lengths and flexibilities are related to the other, while each loaded mass acts to resist acceleration, and influences the amount of energy stored and released.

First we consider the length of the atlatl and its effects on the system. A longer atlatl will transfer less force to the dart in exchange for pushing it through a longer distance. Between initial acceleration and launch, the distance that force is applied is directly proportional to the distance the dart will travel once it is freed. the amount of space between the original

application of force and the point of projectile release is called the path length. The dart launches most efficiently when its direction is tangent to the circular arc of the atlatl. The optimum path length can be achieved by adjusting the length of the atlatl.



$$\text{arc}_L = r\,\theta$$

If $\text{arc}_1 = \text{arc}_2$
$\theta_1 > \theta_2$
Then $r_1 < r_2$

When the atlatl is the proper length, the dart will launch tangent to the arc. This, however, is not quite as simple as it seems owing to what we call launch geometry. Because this system is not the flattest shooting weapon around, the dart must be continually elevated to a greater degree as the target range increases. this adjustment of the projectile position robs the dart of the number of possible degrees that it can traverse in the circular motion before the launch point is reached, shortening the path length. To compensate for this, as the distance to the target increases, so must the span of the atlatl. In the three most popular ranges -- short (10-20 m), medium (30-50 m), and long (100+ m), corresponding short 50 cm), medium (60 cm), and long (70 cm) atlatls provide the best results when used with a properly tuned dart.

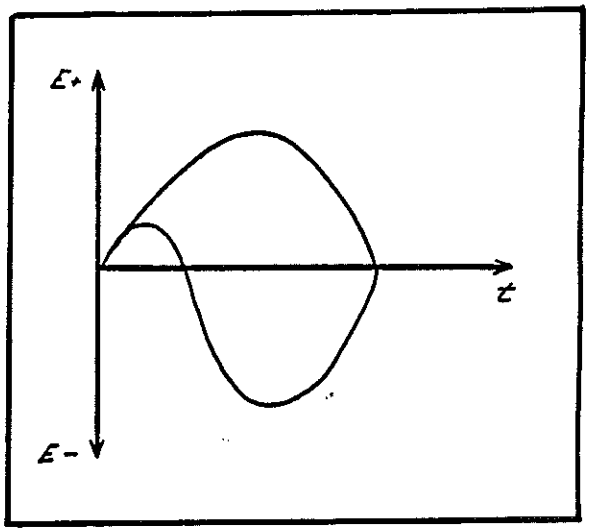
Launch geometry influences the timing of the system, which in turn, effects throwing efficiency. However, this requires the availability of multiple atlatls for various target ranges which makes practical deployment of the system extremely cumbersome. This problem is solved by the weighted atlatl system which has flexibility superimposed into it in order to influence the launch point. this dramatically reduces the sensitivity of atlatl length at various ranges. For this, the average length atlatl is used because it is only slightly out of phase for either long or short range situations. For a correctly tuned dart, the average atlatl is approximately one third the span of the dart as measured from fingerloops to spur.

The hardest and most complicated aspect of the atlatl system is the proper

flexibility of the atlatl. This flexibility must be in direct relationship with that of the dart in order to function correctly. This not only includes just the amount of flex, but also the flex dispersal. The parameters are very narrow -- too soft and not enough energy will be delivered, too stiff and no energy will be gained.

The flexible weighted atlatl works just like the flexible dart with its loaded point mass. Just as the length of the atlatl and dart are related for maximum efficiency, so are their respective flexibilities. And just as the loaded point mass of the dart influences the amount of energy gained and delivered, so does the atlatl weight influence the atlatl. Their respective masses seem to be very different upon first comparison, but when stiffness and length are considered, their masses become correlated. The dart is a long, relatively soft spring with the projectile point mass on the very end, requiring little mass to influence deflection. The atlatl is a short, relatively rigid spring with the atlatl weight positioned less than halfway to the spur.

When the atlatl and dart are accelerated simultaneously, their respective flexibilities are influenced by their loaded masses and they gain an equal amount of energy. When the increase in velocity declines, they have each stored an equal and opposite amount of energy. This energy is then delivered at the same rate to accelerate the dart away from the atlatl similar to a diver propelling himself up and away from a springboard platform.
The atlatl weight's mass and position influence the amount and rate at which energy is gained and delivered in the flexible atlatl. More mass will cause more deflection; less mass will, of course, cause less deflection. The same mass transferred up (toward the spur) or down the shaft of the atlatl will also cause a correspondingly greater or lesser deflection. This makes the atlatl weight a timing device, its true function. it affects the amount and rate at which energy is stored and released, which in turn precisely times the separation point between the atlatl and dart.



BPS ENGINEERING
P. O. BOX 797
MANHATTAN, MONTANA 59741

New members wishing to purchase the Summer and Fall 1989 issues of "The Atlatl," which contain parts I and II of this paper may order them by paying $4.00 each while supplies last.

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STEVE WATTS, DIRECTOR OF THE CENTER FOR SOUTHEASTERN NATIVE AMERICAN STUDIES, AND CHARTER MEMBER OF THE WORLD ATLATL ASSOCIATION ON THE DISTANCE RANGE.

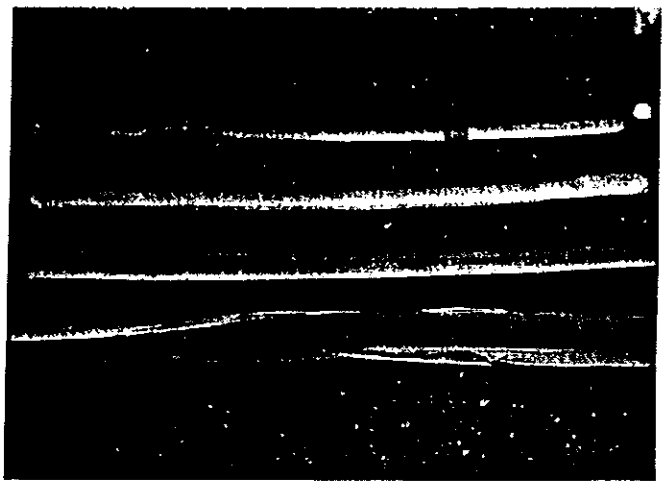
ATLATL WORKSHOP AT THE CENTER FOR SOUTHEASTERN NATIVE AMERICAN STUDIES

November 3--5, 1989

Each year, the Center For Southeastern Native American Studies at the Schiele Museum in Gastonia, N.C. offers a series of aboriginal skills workshops--three-day intensive studies of a particular technology under the direction of Steve Watts.

One of the most popular during the last few years has been, "Atlatl--Weapon of the Ancients." The 1989 workshop drew twelve participants from north Carolina, South Carolina,

WORKSHOP PARTICIPANTS HEAT DART SHAFTS IN STRAIGHTENING PROCESS.



STAGES OF MANUFACTURE: BOTTOM TO TOP, QUARTER-SPLIT BLACK LOCUST, BLANK, PREFORM, FINISHED ATLATL.

Enough said.
(2) Ice age animals (super-sized thick-hided megafauna) had to be penetrated very deeply. Yes.
(3) I have discovered as others that the atlatl spear or dart sustains a harmonic oscillation and propagates transverse waves (Perkins--Leininger - WAA).
(4) An experiment with a whipping oscillating shaft with a conventional type point traveling at a high velocity tends to dislodge, or shake the point loose in it's seat on the shaft, no matter how well bound.
(5) This will tend to do one of three things: Cause a wobble in the shaft, speed loss, or velocity and accuracy [loss].
(6) The solution? A grooved point that the shaft would fit the full length of the groove and fastened in front and rear of the point, the front tied securely, probably with a thin intestine, then pointed sharply and seasoned in a fire.
(7) Now we have a tightly fastened point, with cutting edges extended both sides of the spear shaft.
(8) Unknowingly, they had the same theory as an armor piercing projectile we used in the war. As on an A. P. shell, it has a sharp soft point to more or less put a small dent or penetration and as it crumbles (as on the atlatl) along comes the main force and deep penetration with cutting edges. Common sense?

I submit this little thesis in hope that it might open new thought.

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WORLD'S RECORD ATLATL THROW

At Rabbit Stick - 1989, the big primitive technology event put on by Boulder Outdoor Survival School, BOSS, an attempt was made to place an entry into the Guinness World Book of Records.

Dave Holladay competing with all comers made the longest casts in both the "open" category and in the "Primitive" class.

Open: 428 feet, 6 inches
Primitive: 380 feet, 5 inches

Word has not been heard from Guinness as yet, but we <u>have</u> heard that Dave has already beaten his record throws and is making preparations to set new official records.

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NOTES FROM THE PRESIDENT:

As I mentioned in the fall 1989 <u>ATLATL</u> newsletter, the park ranger at the Valley of Fire State Park near Las Vegas, Nevada, had contacted the World Atlatl Association regarding the organization of a contest near Atlatl Rock in the Park. I have recently talked to Eric Johnson, the park Ranger, and have arranged to meet him in Las Vegas in April at the time of the Society of American Archaeology annual meeting. At that time, we will discuss what it takes to get a contest organized, select an area if possible, talk about rules,

Georgia and West Virginia. The archaeological and ethnographic records pertaining to atlatls in the Southeast, Southwest, Australia, South America, and Upper paleolithic Europe were examined--then students began to construct foreshafted darts and black locust atlatls.

The third day of the workshop was devoted to throwing practice, a demonstration for visitors to the museum, and an informal competition. The latter featured target throws, throws for distance, and throws from a variety of positions--seated, kneeling, and prone.

SCHIELE MUSEUM
OF NATURAL HISTORY
AND PLANETARIUM, INC.
A FACILITY OF THE CITY OF GASTONIA

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Heaven is an American salary, a Chinese cook, an English house and a Japanese wife.

Hell is defined as having a Chinese salary, an English cook, a Japanese house and an American wife.

From *New Woman* magazine.

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LOVE YOUR ENEMIES....IT WILL DRIVE THEM CRAZY.

SECOND ANNUAL INTERCONTINENTAL GAMES OF PREHISTORIC ARMS

It's atlatl time in Europe!
The Second Intercontinental Games of Prehistoric Arms will take place on October 6th and 7th, 1990 in Treignes (Namur, Belgium). Organized by the Centre d'etudes et de documentations Archeologiques, in collaboration with the Prehistorians of the University of Liege and the Laboratory of Environment of the Free University Brussels.
These games will follow an international colloquium on "Methodes et armes de chasse dans la prehistore" and exhibitions. For more information, contact: Pierre Cattelain, CEDARC, 28 rue de la gare, 6390 Treignes, Belgium.

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The following letter, sent to Dr. J. B. Sollberger, Texas Archaeological Society, was also submitted to us by its writer, Joseph M. Grgurich, WAA member. It appears to be in response to the second installment of the BPS paper on the Weighted Atlatl and Dart.

Dear Dr. Sollberger,

I have studied fluted points for many years. I would like to start this in sequence and show that our findings are similar, but from different views, because of studying fast traveling objects in gunnery during world war II.
Thus the flute?
(1) We both agree this blood groove business is a nothing.

publicity, possible attendance, etc. Eric was quite excited about the possibility of having a contest in the park and wanted to know, "How soon?" We agreed that trying to arrange one for this spring didn't give enough time for the necessary arrangements, promotion, etc. and we decided to try to schedule one for fall .... possibly September or October, 1990. The Las Vegas area is very hot from the end of May until late September, (it can get up to 130 degrees) but late fall or early spring is perfect. I will let you know the outcome of my April meeting with Eric in the next newsletter.
NOTE: We have added Nevada, New York, New Hampshire as of the December 1989 roster, and now have a Canadian member as well.

Leni Clubb

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1990 EVENTS

March 24th Glass Buttes Oregon. Atlatl contest being put on by **Brian James**, 3439 14th Ave. NW, Olympia WA 98502, phone (206) 866-8868 and **Jim Riggs**, Rt. 1, Box 44E, Wallowa, OR 97885, phone (503) 437-1895. Contact Brian or Jim for details.

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June 16th - Montana State Championships. Atlatl Contest. Contact Bob Perkins of BPS Engineering, Box 797, Manhattan, MT, phone (406) 284-3307.

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June 16th - Utah Statewide Archaeological Society annual meeting atlatl contest--for members only, to be held in Ogden. Contact Bill Tate, 1191 Nucla St., Aurora, CO 80011, phone (303) 364-0059, Skip Webb, USAS, 300 Rio Grand, Salt Lake City, UT 84101.

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June 29-July 1, Colorado Archaeological Society Encampment at Twin Lakes Campground near Leadville Colorado. Open to all comers, the Atlatl games top prize can only be given to a CAS member. Contact Doug Bowman, 920 Balsam Ave., Cortez, CO 81321, phone (303) 565-6454.

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July 28th, Eastern Seaboard Atlatl Contest, Contact Gary Fogelman, Indian Artifact Magazine, Inc., RR 1, Box 240, Turbotville, PA 17772, phone (717) 437-3698

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THE GRAND-DADDY OF THEM ALL -- THE ATLATL WORLD OPEN
AUGUST 18TH

The atlatl contest will be held at Fort Caspar, Casper Wyoming. Please contact Fort Caspar, 4001 Fort Caspar Rd., Casper WY 82604, phone (307) 435-8462.

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Bob Perkins tells us that there may be a Kansas City Event this summer. At this time it is just a rumor, however.

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MEMBERS, PLEASE! KEEP THIS NEWSLETTER ALIVE.

It may look as if this was a pretty full newsletter, however we would like to be working on future issues too. We require your input. Pictures, letters articles, clippings, etc.....

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EVERY SILVER LINING HAS A CLOUD!

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In the middle ages, illiterate people often signed documents by making an "X". This X, or cross, signified a sacred oath to fulfill the obligations specified in the document. Signers then kissed the X to affirm their sincerity. Eventually the X and the kiss became synonymous.

10% DISCOUNT

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

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.

Tate Enterprises Unlimited, Inc., P. O. Box 110755, Aurora, Colorado, 80011.
Phone, (303) 364-0059
Contact Tate Enterprises for information on their "SpearChucker" kits, readymade equipment, and instructional material.

The WORLD ATLATL ASSOCIATION, Inc.

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