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# LAMBDA ALPHA

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SOCIO-CULTURAL ATTITUDES TOWARDS  
HANSEN'S DISEASE (LEPROSY)

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Wichita State University

The word "leprosy" has for millennia evoked feelings of horror, of mutilation and disfigurement, and of social ostracism. Attitudes towards the afflicted persons have often ranged from social exile to profound compassion for beings so unfortunate. From ancient times, as with most disease, supernatural causation and comparable methods of treatment have been the rule. In addition, in many societies, leprosy is considered to be punishment for moral faults. And in all societies, the overriding question is: what to do with the leper?

This paper is an expression of an interest in leprosy and its treatment and the socio-cultural attitudes from non-lepers to patients, as well as those of the patients toward themselves. This writer worked as an educational missionary in the Virgwi Leprosarium in northeastern Nigeria for about eighteen months, a quarantined reserve of 5,000 acres, serving about 1,600 patients from almost fifty tribal societies. Although his work was primarily in the school, which had about 450 children whose disease had brought them to the leprosarium, he usually sat in on admission and treatment clinics and other medical activities, in addition to a variety of non-medical, non-education ones, from maintaining machinery and vehicles to making peanut oil soap.

Historically, almost certainly, diseases whose superficial symptoms resembled leprosy were considered to be leprosy, and the victims subjected to the prevailing treatment and attitudes towards the disease prevalent at whatever time, and also quite

likely so-called cures, seemingly miraculous, were of diseases other than leprosy. The association of leprosy with the bacillus Mycobacterium leprae was proposed by Dr. G. H. Amauer Hansen in 1864, though the proof usually demanded by medical research since the time of Koch, namely that the organism be isolated in a living being, then grown outside the host and inoculation and infection of a healthy host, was not possible until 1965 with the development of successful laboratory techniques. However, Hansen's theory was almost universally accepted because of the presence of the organism in diseased persons, its absence in healthy ones and its specialized effect on body cells (Brady 1974:22).

Leprosy is unquestionably contagious and in some areas of the world, especially Africa and Asia, is endemic, with an estimated total of ten million cases worldwide. There seems to be considerable difference of opinion as to the level of contagion and indeed the disease exhibits decidedly different degrees of severity in different areas. However, the disease seems to resemble other Mycobacterium infections, such as tuberculosis (Mycobacterium tuberculosis) in that rather extended intensive contact with an infected person seems to be necessary. No accurate measure of this has been established, but authentic cases reveal a latent period from six months to twenty years, with an average of three and one-half years required for incubation (Brady 1974:23-24). The close association of leprosy with tuberculosis is seen in medical conferences and symposia which frequently considered both diseases simultaneously. (Wolstenholme and Cameron 1955:340ff). In northeastern Nigeria

where this writer worked, however, tuberculosis was very rare, though leprosy most certainly was not.

Howard Bosler, M. D., superintendent of the Virgwi Leprosarium, colleague of this writer and a recognized authority on leprosy in West Africa, expressed an opinion also held by other authorities, that children seem much more susceptible than adults, and given the lengthy incubation period, varying from months to several years, Dr. Bosler felt that many, if not most patients were infected as children, with the symptoms not becoming manifest until adulthood. He also stated that in his opinion it would be very difficult for a healthy adult to contract the disease (Personal Communication). It also seems quite uncommon for more than one member of a family to have the disease, with spouses and children seemingly non-infectious to each other, in spite of close social contacts, including sexual relations. In the Virgwi Leprosarium, patients were permitted annual furloughs of one month, returning to their homes. In fact, the quarantine maintained was much more rigid in preventing unwarranted movement in and across the area, rather than restricting the patients.

In common with all organisms, the bacterium responsible for leprosy is subject to natural selection and variant strains of the disease have been identified in present-day populations and quite likely the diseases identified by the ancients, if indeed were truly leprosy, might well have differed from modern forms in some details. However, there are certain symptoms found in all variants and even the ancient records told of anesthesia and numbness, as well as skin manifestations ("as white as snow"),

muscular lesions, and lepromatous nodules, all of which are found today.

Both anesthesia and macules may appear in the early stages of the disease, along with minor paralysis of hand and facial muscles. As the disease advances, the body tissues may set up effective defenses, containing the disease against further development, though crippling deformities may eventually develop. This form of the disease is called "tuberculoid" and is considered relatively benign. If, on the other hand, body defenses are inadequate, a progressively severe form called "lepromatous" ensues. Intermediate types between these are frequently found also, with some areas of the body showing more involvement than others. The reaction of the body to the presence of the bacillus may be relatively slight in the tuberculoid form, though some lesions may occur along with ulceration and edema (fluid accumulation), especially in the legs and under the eyelids. The symptoms of the more severe forms of the disease are similar to these, but are much more intense and more of the tissues and organs are involved. The nervous system may become infected with severe paralysis and crippled deformations resulting (Brady 1974:29-30).

Deformity accompanying advanced cases of leprosy may include the anesthesia and muscle paralysis, including the inability to close the eye. The skin may become puffy and sag, especially on the face. When tendons are involved, crippling of the joints, especially in the hands and feet, may result, and the digits may become shortened, and often cartilage is affected, with stiffening of the joints. Atrophy

of the testes may cause changes in the secondary sexual characteristics. Due to the lack of sensation, infections easily result from injuries and burns, and amputation may become necessary. The muscle paralysis may prevent normal positioning of hands and feet, and clawing of hands and toes results. Severe necrosis in facial tissues, and cartilage and mucous membranes, along with edema of the soft tissue may give a "leonine" or "lion-like" appearance, while the lesions in the throat may severely affect speech. In spite of this list, quite abbreviated, of the external features of the disease, almost all those found in leprosy are duplicated in other diseases, and beyond doubt have complicated enormously the proper diagnosis, with unknown numbers of victims over the centuries being designated as lepers, with all the social attitudes directed at lepers being diverted to them. (Brady 1974: 31-32).

There is serious doubt that the disease called "leprosy" by ancient Semites, including the Hebrews, was truly leprosy, and the words translated as "leprosy" denote defilement, a religious or ritual concept, not clinical in the modern sense (Cochran 1964:2). In fact throughout history, both in Europe and Asia, one may question the proper usage of the term, either in diagnosis or treatment, and in socio-cultural attitudes towards it. However, any resemblance the modern form may or may not bear to these earlier afflictions, certain elements are the same: the disease usually carries the burden of cultural beliefs that it is supernaturally caused (along with all disease), that it is contagious, though in what way may well be misunderstood, so that some form of isolation is necessary,

and it is so massively horrible an affliction that one who was leprous was most unfortunate, and thus logically, one who aided a leper was performing an act of extraordinary virtue and merit.

Through the centuries diagnosis of leprosy was as much a part of ecclesiastical authority, i.e., of the supernatural as it was the medical (hardly more scientific before modern times). From the edicts of Leviticus, throughout the centuries of Judaism and later Christianity, the priest and the physician were both involved, and the stigma of moral fault usually accompanied the diagnosis of the affliction, and certainly few misfortunes could be so much feared as to be condemned to a future of disfigurement and separation from family and society, all the more terrible because even the inevitable death would come only after years of suffering. The leper might be bathed and fed in one town, burned alive in another; vilified by some, an object of deepest sympathy to others while his legal status was most precarious, almost as though he were already dead (Brady 1974:82-83).

In Africa, an area in which leprosy has long been endemic, it is noteworthy that no connotations of moral fault are ever attached to leprosy as such, though presumably the disease might be sent by the ancestors, spirits or gods for the transgression of a tabu, intentional or unintentional. Morality, on the other hand, is primarily a matter between persons, not men and the supernatural beings. Understandably, leprosy is viewed essentially as a terrible misfortune, and the leper a most unfortunate being, but most certainly not a societal outcast.



However, rather than simplifying the problem, it poses more of a dilemma, because in common with most peoples, the Africans fear the contagion of the disease. One simply does not exile a brother, sister, parent or child or anyone in the village because he has leprosy. This writer posed a situation asking whether one should eat out of the dish of food offered to one by a leper. Unanimously, the answer was that one would have no alternative, to refuse a proffered gift of food from a leper would be most reprehensible - in effect saying that one had ceased to be his brother. All agreed, including students with training in Western science and medicine, that in spite of the chance of contracting the disease, they would unquestionably share the leper's offer of food.

How then does the African deal with this disease? In contrast to the concept of ritual defilement of the ancient Hebrews, or the moral turpitude associated with the disease by medieval Europeans, the African seems to view this malady as one of many afflictions which are a part of life, differing primarily in that it is much worse in its long, tortuous duration and its crippling deformation than many of his diseases. Of course, he will attempt to ward off the disease by appropriate charms, talismans or other devices and measures which hopefully provide the supernatural power essential in overcoming the supernatural powers responsible for the disease, and if he still contracts it, his faith in the measures tried remains intact. They failed because they were not strong enough to overcome the conflicting power, perhaps inflicted upon him by a witch or sorcerer or perhaps a capricious spirit-being.

In a similar fashion the attitude of the society to the leper reflects most of the basic social organization patterns of kinsmen and fellow-villagers. The privileges and obligations which are a part of these relationships are not abrogated by the presence of this disease. Even though there is recognition of the possibility of contagion, there is not the utter rejection of the leper from normal society, no more than for other diseases, and since for many lepers, the symptoms are neither acute nor debilitating, at least in its early stages, lepers may lead relatively normal lives for years. The disease itself is rarely fatal, and most lepers die from secondary infections brought on by a general weakened condition, or may survive twenty or thirty years in a gradually deteriorating condition, becoming more and more dependent upon the care of others.

In Africa as elsewhere in the non-western world, the family or extended kin group has the responsibility for the individual, both in controlling and assisting him. This responsibility is maintained by the family whose member may be leprous. Far from being rejected, he remains what he has always been, imbedded in a social milieu, surrounded by his kinsmen, secure in the knowledge that their solicitude will not diminish. It is his right and privilege, it is their obligation. Whatever resources the family has for his care and treatment are available for him. His only responsibilities lie in avoiding, if possible, unnecessary situations of contagion. By extension, his fellow villagers will continue to maintain relatively normal relationships, perhaps coming to salute him even more in his sickness than when he was healthy.

Contrast this with the patterns of rejection of a leper, found in much of the world, including modern industrial societies. Even with the knowledge that a leper who is undergoing treatment with modern drugs including sulfones and antibiotics, many of which are quite effective, will be completely non-infectious within a few days after inaugurating the course of treatment, most of us recoil with some visible signs of repugnance at the thought of contact.

In spite of much knowledge, we still harbor unreasoning prejudices and fears of some diseases, imputing moral turpitude to those unfortunate enough to be afflicted. How do we treat the mentally disturbed, the alcoholic, the sexual deviant? Add to this list the leper, whose disease is to us a linguistic symbol of rejection. On the other hand, the "ignorant" African, ridden by fears of the spirit world, will extend his hand to a leper who comes to his gate, and say, "Maraba" (welcome").

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COMPUTER APPLICATIONS IN ANTHROPOLOGY

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A computer usage survey was mailed to anthropology departments of 84 academic institutions in the United States and Canada which have graduate programs. Five specific areas of use were designated and open-ended answers were solicited.

The five areas of major interest were:

1. Hardware available to the departments
2. Software available
3. Relative frequency of use
4. Types of ongoing research that is computer oriented
5. Computer Aided Instruction (CAI) utilization and computer/mathematical training offered or required

One purpose of the survey was to ascertain if future large scale, quantitative, detailed surveys were warranted. Judging from the nature of the small, though by no means apathetic, response, it appears that many anthropology departments across the nation should first be educated about the potential uses of computers for education and simulation studies as well as conventional data storage.

Only 22 responses were received from the 84 queries mailed. Four returns were unsigned and contained no information. Follow-up by phone and personal contact at meetings indicated either limited or zero utilization of computers. One return, from Brown University, contained a brief note from the secretary that no computers were being used. Another return by Robert Bell of the University of Oklahoma was too general to warrant inclusion in Table 2 which summarizes the comparable information gained from the survey. Table 1 alphabetically lists schools that submitted responses which could be compared in summary form.

## HARDWARE

It is readily apparent from Table 2 that most academic institutions offering graduate degrees in anthropology have large and relatively active digital computer centers which are readily accessible to all departments, which justify their use. A variety of computers, plotters, and remote terminal devices appear to be widely available. Thus, availability of hardware is not a limiting factor; however, lack of funds to purchase CPU and terminal time may be an important limitation, even though most academic centers allow use to all while charging only those who can pay (personal communication, Joe DiSalvo, Indiana University). Nevertheless, remote terminal devices must be supported with "hard" money. Discontinuation of funds resulted in the removal of Rochester's departmental terminal.

## SOFTWARE

Software, defined as the various programs operating the computer hardware, is limited in this survey to programs and specifically excludes programming languages. Many of the available "canned" programs do not require computer-programming skills to use.

It is known that all of the 84 universities surveyed maintain sizeable libraries of these typed programs. The most often mentioned and used by anthropology departments included BMD, SPSS, SAS, OSIRIS I - III, and KINPROGRAM. Many institutions also have a large assortment of information retrieval systems such as SELGEM. Interactive systems and text-editors such as WYLBUR and MUSIC are also found. Finally, locally pro-

duced statistical and convenience packages which require only slight modifications are also available.

It is apparent from this sample that, like hardware, software is not a limiting factor. A battery of programming skills is not a prerequisite to either data processing or application of computer resources to anthropology. Even though competent manipulation of some existing programs does require access to programming aid, this is usually available at minimum charge to faculty members.

#### FREQUENCY OF USE

The reported returns expressed computer usage estimates in a variety of units. SUNY-Albany, Ohio State, Stanford, Rochester, and the University of Arizona used dollar allocations and expenditures as the unit of description. The University of Pittsburgh and the University of Wisconsin - Milwaukee estimated in number of "jobs" or "runs". The Universities of Pennsylvania, Florida, Case Western, Hawaii, Syracuse, Missouri, and Arizona State reported "high" and "moderate" to describe their usage. However, the base for comparison was not mentioned! Stonybrook listed number of hours, but did not specify whether this was real-time hours or CPU hours. This variability in use estimates makes comparison between groups difficult, but not impossible.

It is apparent that the University of Arizona's expenditures far exceed the others in this reported sample, with the possible exception of Missouri. Long recognized as a leader in the field, the department employs seven professional programmers, fourteen full-time equivalents, and three keypunchers, most of whom are also trained in anthropology. This department is easily distin-



guished from others in the country where users are personally responsible for data transformation as well as the routine tasks required in data manipulation.

The Anthropology Department at University of Missouri is the second or third largest user on campus (22 users). As such, it is suspected that this department's activity must surely be comparable to Arizona's. However, R. A. Benfer was unable to cite figures as specific as those of Larry Manire (Director of Data Processing, Arizona State Museum - University of Arizona).

SUNY-Stonybrook, with 1000 hours computer time per semester, and the University of Wisconsin - Milwaukee, with 20-140 runs a week, are included in the group of high users. SUNY-Albany, with a \$12,000 budget, also deserves placement in this category of users.

Ohio State, Stanford, Rochester, and possibly the University of Pennsylvania appear to have comparable levels with non-sponsored research usage running between \$2,700 and \$5,000 a year. It must be remembered that due to the variability in rate policy between the computer centers of the different institutions, no linear relationship exists between different departmental expenditures. The placement of the University of Pennsylvania in this category is based on subjective evaluation of the literature since no specific data was volunteered in either the letter or follow-up telephone call.

Arizona State, Temple University, Case Western, and the University of Florida are roughly comparable to the above mentioned groups. They all make consistent - if not high - use of the computer. The data received was not quantifiable.

Syracuse, University of Hawaii, and the University of Oklahoma use the available computer resources sporadically. However, they should be categorized separately from those universities where no usage occurs.

Table 2 indicates which subdisciplines monopolize computer resources at each listed institution. In seven schools, the computer-resources are used by all sub-disciplines relatively equally. Archeology and physical anthropology shared equal use in two schools. Archeology was, by far, the highest user in the two Arizona institutions, as was physical anthropology (biological anthropology) in two other schools. At three schools, social anthropology indicated the highest use. Table 3 summarizes this data.

The data compiled in survey precludes a statement about which subdiscipline of anthropology makes the most use of computer-resources. Therefore, this point should be stressed: There is no area of anthropology that is prevented by the nature of its subject matter from applying the powerful electronic aids offered by the various computer-resources.

## DISCUSSION

Some redundancy or overlap of computer-oriented research was discovered in this study. Since possible prevention of such time-wasting duplication of effort was one of the objectives of this survey, these findings were of great interest.

Clues to the probable existence of duplication of effort in various institutions was stressed by Larry Manire. The application at Rochester of G. A. Collier's KIN-PROGRAM (Stanford) is a positive effort toward reducing unproductive redundancy

since similar types of research are being conducted at both institutions. It should be mentioned that both Stanford and Rochester have similar hardware and use the interacting text-editor WYLBUR system via remote terminals.

On the negative side, it appears that duplication may be occurring between the University of Florida and Rochester where current work is proceeding in linguistic analysis and dictionary formation. Apparently, separate programming efforts are in effect because workers in both schools apparently are not communicating with each other! Also, R. M. Hursh of SUNY-Albany and several graduate students are developing a system involving Ethnographic Atlas data which could possibly lead to a general purpose system for cross-cultural analysis. This could probably help Tom Evasce, a graduate student at Ohio State, who is programming data with Dr. Erika Bourguignon which is also based on the Ethnographic Atlas. We have informed Mr. Evasce of the SUNY research.

One of the distinctly disappointing aspects of this study is the apparent lack of research into novel applications of computer-resources to anthropology. In this regard, the University of Arizona is by far the most innovative. Their large, professional Staff is attempting to modify currently existing programs to the needs of the various departments and subdisciplines. However, most of the current work and applications of computer-resources in anthropology is in the traditional areas of data analysis. The necessary research to exploit analog applications to anthropology is apparently not being done; what is being done is work based solely on statistical manipulation. Innumerable non-statistical applications exist but exploration in this field

is apparently lacking in anthropology. Perhaps we should ask the question: where, in a time of retrenchment, does one apply for funding for this type of endeavor?

There are two areas of computer exploitation that are immediately available. The first is computer aided instruction (CAI). While many schools offer statistical training in which the computer provides the computational machine, the numerous existing programs which involve the interactive use of a terminal to teach statistics as well as other subjects is utilized at very few schools. Only one in this sample, Stanford, is making use of this available technology in its anthropology programs, and it is used for statistics!

The second area of use that could be immediately implemented is information retrieval (IR). While some schools use museum originated systems like SELGEM for information storage and for retrieval, no mention of broader bibliographic and literature search IR systems was found. Specifically, there is MEDLINE<sup>TM</sup> (National Library of Medicine), Lockheed's DIALOGUE<sup>TM</sup> (Plato Alto), and SDC (Systems Development Corporation) all of which offer on-line searches of many files supplied by secondary publishers such as Cumulative Index Medicus, Social Science Citation Index, Biological Abstracts, ERIC, and Science Citation Index<sup>TM</sup>. Lockheed's DIALOGUE<sup>TM</sup> currently offers access to 27 files.

#### EDUCATIONAL REQUIREMENTS

It is strikingly apparent that computer-resources are being applied to all subdisciplines of anthropology. Thus, it was assumed that educational requirements and course offerings, at least at the larger, doctorate granting institutions would be

shifted to meet needed skills in the future. Apparently, this is not the situation. Statistical methods and mathematical logic should become part of the standard curriculum of anthropology departments. In our sample only 5 of the 18 schools required statistical courses, computer programming or mathematics.

This is somewhat surprising considering the amount of use occurring and the level of mathematical skills needed in multivariate statistics which presumes knowledge of matrix theory. Game theory and complex simulation programs require at least some knowledge of calculus. Thus it would seem that if current students are being trained to meet future demands, their training should include these subjects.

#### CONCLUSION

This survey was unable to discover a significant amount of duplicative current research. However, it was found that SDC's SSIE file and Lockheed's FOUNDATION GRANTS AND FOUNDATION DIRECTORY files will soon provide this service. The present study did, however, indicate a trend towards increased traditional use.

Most advanced educational institutions have roughly comparable hardware and software. The use of this material rests on the skills and ambition of the individual. The majority of Anthropology Departments, with the notable exception of the University of Arizona, are not oriented towards computer-resources. The limiting factor seems to be the awareness and competence of the individual researcher. Those who are working with computers are for the most part, aware of ongoing research in their specialized fields. With the increasing popularity of

interdisciplinary approaches to specialized subjects, the computer may be a powerful tool to facilitate communication.

It was disappointing to discover that none of the respondents indicated any interest in developing innovative CAI programs for anthropological education. Only Stanford was using interactive CAI as a supplement to teaching statistics to those students who elected to take the course. Statistics is not anthropology, per se.

Equally disheartening was the fact that only 20 universities were able to contribute data to this survey. The remaining 84 schools either did not respond to the letter or indicated limited use of computers. Several non-respondents were personally contacted by telephone and/or at society meetings and also indicated that no data was available for this study.

#### FUTURE PLANS

A summary of this report will be submitted to the American Anthropological Association with a request that they appoint a TASK FORCE to compile more complete data and launch an educational program focused on the value of computers in anthropology.

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Table 1. Alphabetical listing of schools included in this survey.

---

University of Arizona  
Arizona State University  
Brown University  
Case Western Reserve  
University of Florida  
University of Hawaii, Maniloa  
University of Missouri  
Ohio State University  
University of Oklahoma  
University of Pennsylvania  
University of Pittsburgh  
University of Rochester  
Stanford University  
State University of New York, Albany  
State University of New York, Stonybrook  
Syracuse University  
Temple University  
University of Wisconsin, Milwaukee

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| SCHOOL               | HARDWARE   | SOFTWARE | USAGE                        | RESEARCH                     | CAI           | RESPONDENT           |
|----------------------|--|----------|------------------------------|------------------------------|---------------|----------------------|
| Albany               | UNIVAC 1110<br>DCT 500 terminal in department                  | Full     | \$12,000/annum<br>Biological | Cross-cultural studies<br>DA | None          | Thomas Mercer Hursh  |
| Ohio State           | IBM 370  | Full     | \$1500+/sem<br>All           | DA<br>Cross-cultural studies | None          | Micheal W. Gendler   |
| Pennsylvania         | IBM 370<br>Departmental terminal                               | Full     | Full<br>All                  | DA                           | None          | Francis E. Johnson   |
| Florida              | (na)   | (na)     | Regular<br>All               | Linguistic                   | None          | Paul L. Doughty      |
| Case Western Reserve | UNIVAC 1108<br>PDP II in Biometry<br>NOVA mini in anthro.dept. | Full     | Moderate<br>Phys and Arch    | DA                           | None          | Pete E. Lestrel      |
| Hawaii               | IBM 2741 terminal in bldg.                                     | Full     | Sporadic<br>Arch and Phys    | DA                           | None          | Michael Pietrusewsky |
| Syracuse             | IBM 370/155<br>IBM 360/25<br>PDP 10                            | Full     | Little or none<br>Physical   | DA                           | None          | Mark L. Fleischman   |
| Pittsburgh           | DEC-1077   | Full     | 500 jobs/annum<br>All        | DA                           | None          | Allen L. Tan         |
| Stonybrook           | UNIVAC 1110<br>SPECTRA 70/6                                    | Full     | 1000hrs/sem<br>Social        | DA(Data Analysis)            | None          | R. E. Gardner        |
| Temple               | CDC 6400<br>(2)  | Full     | (na)<br>Social               | Gaming Simulation            | Supplementary | Henry A. Selby       |

(continued on next page)



| SCHOOL           | HARDWARE   | SOFTWARE | USAGE                                       | RESEARCH  | CAI                        | RESPONDENT         |
|------------------|--|----------|---|---|----------------------------|--------------------|
| Arizona          | CDC 6400<br>DEC 10   | Full     | High<br>Archeology<br>\$28,000/per<br>annum | Information<br>Storage/re-<br>trieval and<br>processing | Supple-<br>mentary         | Larry Manire       |
| Stanford         | IBM 360/67   | Full     | \$5000/yr<br>All                            | KINPROGRAM<br>-G.A. Collier                             | Inter-<br>active<br>(stat) | George A. Collier  |
| Missouri         | IBM 370/185<br>Calcomp plot-<br>ter<br>UNIVAC inter-<br>pretor<br>029 Keypunch | Full     | High<br>2nd or 3rd<br>on campus<br>All      | DA  | None                       | R. A. Benfer       |
| Arizona<br>State | UNIVAC 1110  | Full     | Intermediate<br>Archeology                  | DA  | None                       | S. W. Gaines       |
| Rochester        | IBM 360/65<br>Calcomp plot-<br>ter<br>Departmental<br>terminal                 | Full     | \$2700/yr<br>Social                         | DA<br>Linguistics                                       | None                       | Robert S. Merrill  |
| UMW              | UNIVAC 1106<br>UNIVAC 1110<br>Arch lab<br>plotter                              | Full     | 20-140 runs/<br>week<br>All                 | DA  | None                       | Ralph W. Alexander |

Table 3. Usage of the computer by the subdisciplines of anthropology.

| Subdiscipline                 |                         |                         |                     |
|-------------------------------|-------------------------|-------------------------|---------------------|
| <u>Archeology</u>             | <u>Biophysical</u>      | <u>Sociocultural</u>    | <u>Linguistic</u>   |
| <sup>1</sup> Arizona          |                         |                         |                     |
| <sup>1</sup> Arizona<br>State |                         |                         |                     |
| Case Western                  | Case Western            |                         |                     |
| Hawaii                        | Hawaii                  |                         |                     |
| Missouri                      | Missouri                | Missouri                | Missouri            |
| Ohio State                    | Ohio State              | Ohio State              |                     |
| Oklahoma                      |                         |                         |                     |
| *Pennsylvania                 | *Pennsylvania           | *Pennsylvania           | *Pennsylvania       |
| <sup>2</sup> Pittsburgh       | <sup>2</sup> Pittsburgh | <sup>1</sup> Pittsburgh |                     |
| *Stanford                     | *Stanford               | *Stanford               | *Stanford           |
| <sup>2</sup> Albany           | <sup>1</sup> Albany     | <sup>3</sup> Albany     | <sup>3</sup> Albany |
| *Stonybrook                   | Stonybrook              | Stonybrook              | *Stonybrook         |
|                               | Syracuse                |                         |                     |
| Temple                        | Temple                  | Temple                  |                     |
| Wisconsin                     | Wisconsin               | Wisconsin               |                     |

\* assumed

1 usage rank (highest)

2 usage rank (secondary)

3 usage rank (tertiary)

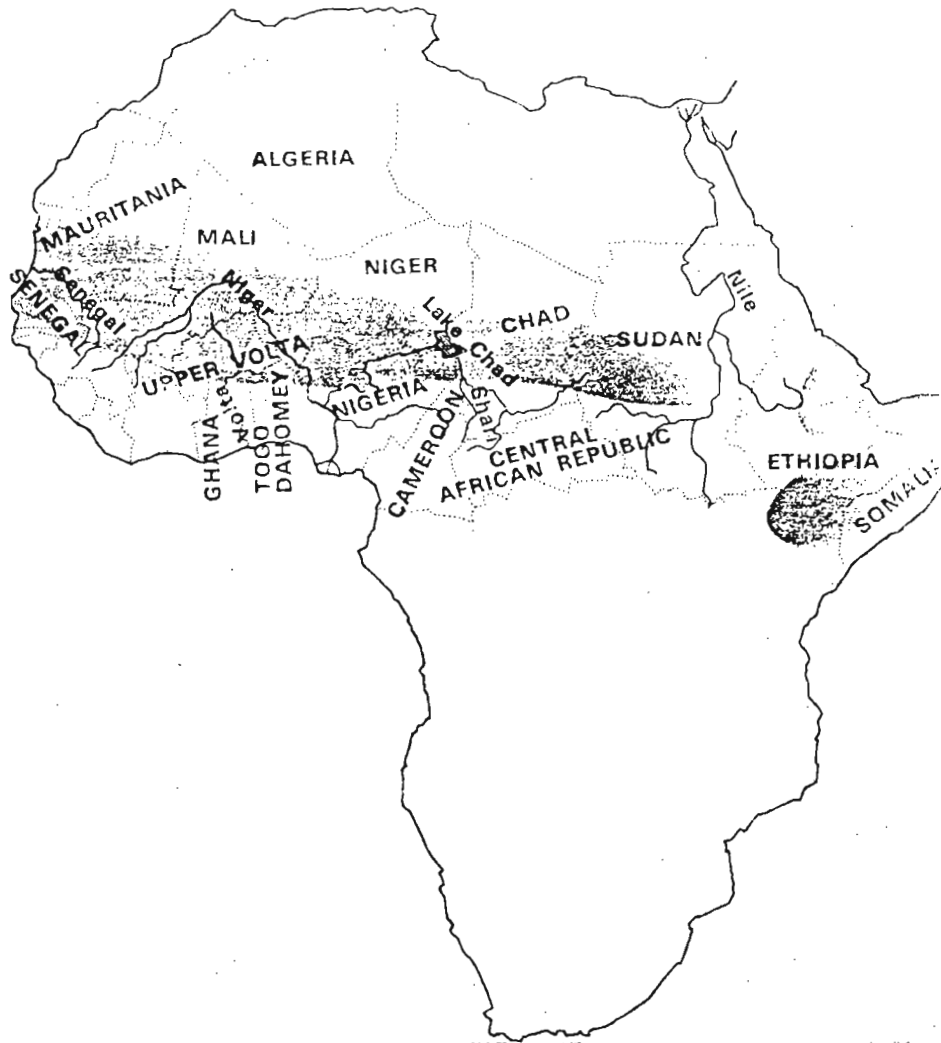
TWO FAMINES: THE SAHEL AND IRELAND

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Famine, the Second Horseman of the Apocalypse, has afflicted man throughout history. Famines are more frequent than many realize; for example, there has been a serious famine nearly every year since the end of World War II (Mayer 1975). The famine in the Sahel which ended last year and the Irish potato famine of the last century are two famines of significant duration and scope. Neither famine was induced or exacerbated by war or civil disturbances, so the operation of secular forces can be more clearly seen. Both are reasonably well documented, and they provide an opportunity to compare the course and effects of famine in two different cultures, with differing subsistence and economic patterns. The 120 years which separate these two famines provide a comparison of relief philosophies and organization.

#### THE SAHEL 1967-74

The term "Sahel" comes from an Arabic term meaning "borderland" or "margin", and is essentially a climatic term designating a belt of semi-arid land extending across Africa from the Atlantic coast to the borders of the modern state of the Sudan, lying between the Sahara and the savanna (Fig. 1)(Brabyn 1975). This area, some two million square miles in extent, is vaster than India and includes nearly 20% of Africa's land area (Rosenthal 1974). Rainfall within this zone normally varies from 100 to 600 mm/year, 80% to 90% of which is lost through evaporation. Relatively slight variations in rainfall can have dramatic consequences, since just a few millimeters of annual rainfall can determine whether an area is viable grazing land or part of the Sahara (Brabyn 1975).



**THE SAHEL.** Spanning the breadth of Africa, the region known as the Sahel (outlined in grey on map) is more than 30 times the size of England. The two grey patches on the right of map indicate areas of Ethiopia and Somalia forming part of the Sahel zone and also hit by the drought, in 1973 and 1974. Countries named on map are those directly or indirectly affected by the Sahel catastrophe. Opposite page: mother and child lying exhausted on the sand—an image of the human misery inflicted by the worst drought experienced in the Sahel during this century.

Figure 1. (Brabyn 1975)

The famine in the Sahel considered here was precipitated by a seven year drought which persisted from the failure of the rains during the 1967-68 rainy season until the recurrence of significant rainfall in late 1974 (NY Times 23 Aug. Sep 1974). This drought was caused by a southerly shift in the "intertropical discontinuity" which defines the northern margin of the moist monsoon airstream (Ross & Bryson 1974). Droughts of great length and severity have occurred in the Sahel in the past, including a very severe drought only fifty years ago. However, the 1967-74 drought was the worst ever recorded, and broke records established in the fourteenth century (McLeod 1974, Rosenthal 1973). There is evidence that the extraordinary severity and duration of this drought may be related to a progressive world-wide cooling trend (Ross and Bryson 1974), but the mass of evidence indicates that longterm trends in world climate are only peripherally related to the severity of the famine in the Sahel.

The Sahel is peopled by two major groups. Ninety percent of the population are herders, principally Tuareg and Fulani. The remainder, concentrated in the southern, wetter, portion of the zone, are Negro peasant agriculturists. Prior to the colonial period the nomadic herders were dominant. However, the imposition of colonial government brought with it an "anti-pastoral outlook", a trend accelerated after independence. The colonial and post-colonial regimes have both been based on the agriculturalists, and have tended to support their interests. This hostility and enmity toward herders is an expression of the pattern of nomad-sedentary hostility frequently found in the Old World (Bugnicourt et al 1975, Sheets & Morris 1974).

The response of the herders to ecological stresses, particularly drought, was predicated on their control of their resources, especially access to wells and rangeland. The imposition of colonial control eliminated the Tuareg and Fulani ability to manipulate these resources and opened rangeland and wells to exploitation by agriculturalists. This opening of former grazing lands to agricultural exploitation both limited the land available for grazing and forced the nomads into more marginal areas closer to the Sahara proper (Brabyn 1975, MacLeod 1974).

The colonial period, in addition to ending nomad hegemony over rangeland and wells, also brought means to control disease among livestock. Since the herders retained control over only one resource, their cattle and other livestock, a maximum number of animals was essential in order to insure survival. These factors combined to generate a dramatic increase in the size of the nomads' herds (Bugnicourt et al 1975, MacLeod 1974). The digging of deep wells accelerated the increase in herd size and increased the concentration of animals on diminished areas of grazing land in proximity to deep wells (Bugnicourt et al 1975). Overgrazing was becoming common before the drought began (MacLeod 1974).

The effects of the lack of water began almost immediately after the rains failed during the winter of 1967-68. Food aid shipments were initiated in 1968. As the drought progressed crop failures became chronic. By 1971 Lake Chad had shrunk to one-third its normal size, and the Niger and Senegal rivers shrank to shallow streams. The drying Niger sank below a record level set in the fourteenth century (Sheets & Morris 1974).

As the rains continued to fail and the grass ceased to grow, the herders began to systematically strip the land of its vegetation in order to maintain their herds. Overgrazing and trampling destroyed vegetation in the neighborhood of watering places, which became congested as shallow sources dried up. As the drought progressed, grass was exhausted and herders cut trees and bushes in order to obtain forage. These processes - overgrazing, trampling, and tree and brush cutting - resulted in permanent desertification in much of the Sahel (Bugnicourt et al 1975, MacLeod 1974, Rosenthal 1973).

Desertification in the Sahel is almost solely the result of removal of vegetation by overgrazing. This causes the removal of fine soil particles and increased water evaporation, exacerbating the dessication already present. Rainfall, when it comes, is thus less effective. Surface wind speed increases and sands blow in and cover the soil. The singular effect of overgrazing in producing desertification in the Sahel is dramatically illustrated by an Earth Resources Technology Satellite photograph taken at the height of the drought (Fig. 2). The darkened area is a 250,000 acre French-owned ranch, which is fenced and protected from overgrazing. The vegetation has not been stripped and desertification has not taken place. The control of grazing is the only difference between the ranch and the surrounding area (Brabyn 1975, MacLeod 1974).

In the struggle for survival, then, the herders destroyed their resource base. Their herds had grown beyond the land's ability to maintain during periods of drought. After the land had been stripped of vegetation, the animals began to die. They



## SATELLITE'S EYE VIEW ► OF DESERT RANCH

In a study on the Sahel carried out for Unesco's "Man and the Biosphere" programme, an American specialist, Norman MacLeod, stresses the value of remote-sensing techniques in drawing up a map of natural resources, carrying out surface water studies, and analyzing cropping patterns, etc. Dark-coloured polygon on photo right, taken by earth-girdling satellite on May 8, 1973, is formed by vegetation contrasting with the surrounding desert. It marks the boundaries of the "Toukounouss" ranch, established in Niger several decades ago. To maintain this greenery in the midst of an arid landscape, the ranch owner divides his land into five grazing areas, only allowing his cattle to graze on a single area each year. This "rotation" gives the grass a chance to grow in the other four areas. Wire fence surrounds the ranch.

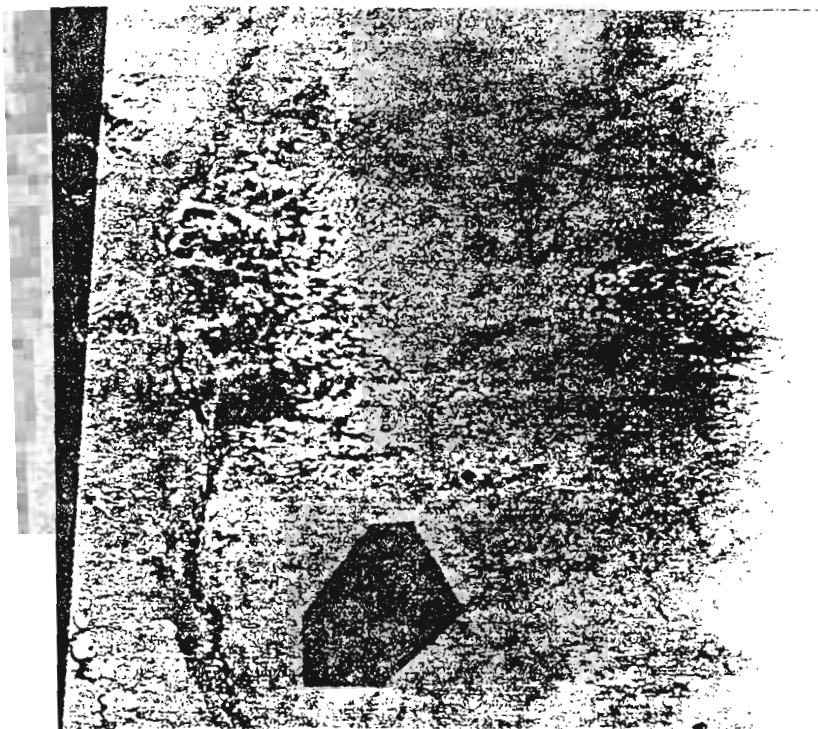


Figure 2. (Brabyn 1975)

died not of thirst, but of starvation. The loss of livestock in the Sahel was catastrophic. In 1973 estimates of losses ranged from 33% in Niger, the lowest, to virtual extinction in Mali. As their cattle died, the Tuareg and other herding peoples began to drift into refugee camps (Brabyn 1975, Bugnicourt et al 1975, MacLeod 1974, Sheets & Morris 1974).

Casualties in this famine are difficult to estimate. The only adequate and comprehensive statistics were gathered by U. S. Public Health Service surveyors in 1973. These surveyors estimated that over 100,000 people died in the Sahel in 1972 alone. Most of these victims were children. The major killer was measles, although there was a significant increase in deaths from cholera, tuberculosis, and other diseases (Sheets & Morris 1974).

Measles in the Sahel is the same illness familiar to Americans, but in synergy with malnutrition, as was the case in the Sahel, it is not a minor inconvenience but a deadly scourge. Respiratory complications are common, but the deadliest symptom is diarrhea. This is usually the proximate cause of death when it results; if it does not kill the patient it often triggers more obvious malnutrition symptoms. Significantly, most of the photographs of children in relief camps show classic symptoms of marasmus. The effects of the measles alone are often of significant duration; the weight of children is often depressed below the pre-illness level as late as five months after clinical recovery (Mayer 1969).

Famine relief in the Sahel was an international effort, but most relief was undertaken by the United States Agency for International Development, assisted by the United Nations

Food and Agriculture Organization. The major impediment of effective relief was bureaucratic ineptitude. Political considerations also hampered the relief effort. Both of these relate to the most conspicuous failure of the relief efforts throughout the period of drought: the failure to gather, retrieve, and use information (Sheets & Morris 1974).

As Mayer (1975) notes, the most immediate problem in a famine is to obtain accurate information. Because of the failure of the relief agencies working in the Sahel to do so, almost every aspect of the relief effort was inhibited. No comprehensive or accurate intelligence on the situation in the Sahel was available to AID or FAO decision makers until 1972, although the drought was then five years old. Because of inadequate planning and lack of information regarding transportation facilities, relief food rotted on the docks in Dakar while deliveries in the Sahel fell short; an English reporter stated that the only fat animals he saw in Africa were the wharf rats in Dakar, while at the same moment people and livestock were starving in the interior. Number Two sorghum was the primary relief food item sent, which caused diarrhea and death among nomads used to a high-protein diet (Sheets & Morris 1974).

A particularly tragic aspect of this famine was the discrimination shown against nomad refugees. Both nomads and Negro agriculturists were affected by the drought, but relief for the agriculturists was usually provided in their own villages (Rosenthal 1973 & 1974, Bugnicourt et al 1975). However, discrimination against nomad refugees seems to have been uniform in the Sahelian nations; in every case evaluated,

the indicators of malnutrition and famine-induced mortality was more severe among nomads, even when nomad camps were side-by-side with agriculturist relief sites. In Niger, for example, PHS surveyors found one sedentary village receiving 4700 kilograms of grain for 400 people for a period of one month, while nomads in the same area received one bowl of milk per day (Sheets & Morris 1974). The anti-pastoralist attitude of the farmers and the Sahelian governments has apparently not ameliorated.

Beyond the human tragedy of this famine and the economic disaster it represents for the Sahelian nations, the most lasting and most severe consequence has been the damage done to the nomads' culture, especially that of the Tuareg. The cattle and livestock on which nomad society was based are gone, and the social structure has been irreparably damaged. The position of Bugnicourt et al. (1975) is that the Tuareg culture has been virtually obliterated. "The most widespread feeling is that it is going to have to find a new land for itself"(Bugnicourt et al 1975:28). Even if this evaluation is somewhat extreme, it is apparent that Tuareg culture will only continue in an attenuated form. Only 10% of the Tuareg refugees have indicated a willingness to return to herding, even if their animals are restored (Bugnicourt et al 1975, Rosenthal 1974). It appears that this famine has left in its wake a new oppressed urban minority in a part of the world that can ill afford the social consequences (Bugnicourt et al 1975).

## IRELAND 1845 - 1846

The most serious Irish potato famine, the "Great Hunger" of Irish folklore, was caused by a general failure of the potato crop as a result of infection by potato blight, Phytophthora infestans. This fungus attacks both the growing plant and the ripened tubers, killing the plant and reducing the potato tubers to a semiliquid mass, "a stinking, rotting mess" even after harvesting. The blight first appeared in Ireland in August 1845, and is still endemic there. The first infection was limited in extent and caused only local food shortages. However, 1846 was exceptionally warm and damp --- ideal conditions for blight --- and virtually the entire potato crop was destroyed (Woodham-Smith 1962).

Ireland could ill afford such a disaster. On the eve of the Great Hunger, Ireland was supporting the densest population in the Western world. Disraeli once stated that on arable land (nearly all of the land, thanks to the potato) the population of Ireland was as dense as that of China. The Census of 1841 gave a figure of greater than eight million, and the population in 1845 has been estimated to exceed nine million (Woodham - Smith 1962). The extent of this crowding can be gauged by a comparison with modern figures; the combined population of the Republic of Ireland and Ulster barely exceed four million, less than half the population of Ireland at the time of the famine (World Almanac 1975). Ireland had been undergoing an astounding growth in population since the late eighteenth century, having registered an increase of 172% between 1791 and 1841. Even considering the probable errors in the earlier census,

this growth rate was remarkable. The heaviest populations, both in absolute numbers and in density, were found in the least fertile regions, especially Mayo and the rest of Connaught. These were the very regions most singularly dependent on the potato (Woodham-Smith 1962) .

The reasons for this phenomenal rise in population are not entirely clear. It was probably not due to an increase in medical knowledge or facilities or in an improvement in sanitary standards. Medical care was scanty throughout Ireland, but particularly in the West, where the highest population densities were generally found and which supported the largest rural population. There appear to be two reasons which may account for this increase. First was the low age of marriage. During this period the Irish married quite young, both sexes typically marrying in their mid- to late teens, and began producing children almost immediately. This trend was encouraged by the very poverty and low standard of living characteristic of the Celtic Irish: "They cannot be worse off than they are, and they may help each other (Woodham-Smith 1962:30)." Ireland was a subsistence agricultural economy, and as in nearly all such economies children were economic assets and insurance against indigence in old age. Furthermore, providing the potato crop was adequate, the cottier or tenant farmer did not lead an excessively miserable life, in spite of his poverty. His diet of milk and potatoes was nutritionally adequate, if hardly sound, and the lack of clothing and material possessions was ameliorated by two factors. The cultivation of the potato entailed little outdoor exposure during the winter. As a tenant or cottier, cheap and

abundant fuel was available to him in the form of turf, so his cabin was generally warm and dry (Woodham-Smith 1962).

The primary factor permitting the population to rise, however, appears to have been the cultivation of the potato. The potato became the dominant subsistence crop after the shift from grazing to tillage in the eighteenth century (Green 1957). The potato could adequately feed a family from a tiny plot: its productivity was such that on the eve of the famine only  $1\frac{1}{2}$  acres could provide food for a family of six for a year (Woodham-Smith 1962). The population densities this crop permitted are startling. County Mayo, one of the most infertile and remote in Ireland, supported 475 persons per square mile in 1841 (Green 1957).

The social conditions in Ireland on the eve of the Great Hunger were a result of centuries of colonial exploitation by the English. The pattern of exploitation which became manifest after the coronation of Mary Tudor was remarkably analogous to that seen in the settlement of whites in North America. Land was confiscated by the Crown from the Irish and settlers from England and later Scotland were offered land as a reward or inducement for services rendered, a process termed "planting." Cromwell's plantation even included a formal "reservation:" he intended to remove all the Irish to Connaught and cordon off the province with troops, leaving the rest of Ireland open to English settlement. These schemes all failed to a greater or lesser extent, primarily because English peasantry had no great desire to occupy Irish lands and the native Irish were a much more willing and a much cheaper source of labor. The major permanent result was the dispossession of virtually all the

native Irish from their lands and their reduction to tenant status and the creation of a class of English landlords (Hayden & Moonan 1922).

This system combined the worst aspects of feudalism with almost none of its compensations. There was no paternalism on the part of the landlords, and no sense of feudal reciprocity. The system of leasing property adopted in the eighteenth century deprived the Irish of any incentive or security. By law, any improvement to the land or property on it became the property of the landlord upon the expiration or termination of the lease, and nearly all tenants in Ireland were tenants "at will," meaning they could be evicted at the will of the landlord without compensation (Woodham-Smith 1962).

The superior virtues of potato cultivation under the circumstances is apparent. The potato required virtually no capital investment. It assured its cultivator of adequate food, and the land required little preparation to grow it. The lease system encouraged subdivision of the land; the capabilities of the potato made extremely small plots of land economically viable. In 1841 nearly half of all the land holdings greater than one acre were less than five acres.<sup>1</sup> Typically the Irish farmer would grow potatoes for his own and his family's use, while he would pasture an animal or grow grain for a cash crop, the cash being intended primarily for his rent (Woodham-Smith 1962, Green 1957).

By 1845 the potato had become almost the sole food of fully one-third of the Irish population and was the main article of

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<sup>1</sup>This rather odd statistic is in two references, and in neither is it made entirely clear. I assume that holdings of under one acre were not considered farms by the census surveyors.



diet of a much larger number (MacArthur 1957). "The existence of the Irish people depended on the potato entirely and exclusively (Woodham-Smith 1962:31)." The potato was life itself to three classes of Irish society: the tenants who held land of one to five acres, cottiers, who lived on the land of farmers for whom they worked, and laborers who lived on land hired yearly in order to obtain a potato crop. These classes bore the brunt of every food shortage, and suffered terribly whenever the potato failed, as it did in 1800 and 1816 as well as in 1845 (MacArthur 1957). The laborers, the poorest and most destitute class, starved annually, even before the famine struck, since they were without money or potatoes during the twenty-odd weeks between potato-growing seasons (Woodham-Smith 1962).

The potato blight, then, struck an overpopulated Ireland where starvation was already an annual phenomenon and whose population largely depended on the potato for survival. The blight struck with awesome rapidity: most of the fields in Ireland were blackened by the fungus within a few days during the summer of 1846. Starvation began in earnest that winter, when the last of the food reserves maintained by the people was exhausted. The blight was not severe the following year, but starvation continued because there was no food remaining. The harvest was excellent, but so little had been planted that an insufficient crop was harvested. The hopes of the people rested on the 1848 crop, but the blight again ravaged Ireland. This continued until the 1849 potato crop had been harvested (Woodham-Smith 1962).

Casualties of the Great Hunger are not precisely known, but estimates have been made using the figures obtained by the Census

of 1851. The population of Ireland declined by  $2\frac{1}{2}$  million between 1841 and 1851, allowing for a projection of natural increase during the period which could have been expected without the intervention of famine. Roughly one million persons emigrated during this period, primarily as a direct result of the famine. It can thus be assumed that approximately one million Irish died as a result of the potato famine (Woodham-Smith 1962). The major cause of death was typhus and relapsing fever (MacArthur 1957).

Both typhus and relapsing fever are endemic to Ireland. Both are lice-borne diseases. The hardships and misery engendered by the famine caused a marked reduction in sanitary standards, as clothing was pawned to buy food and as survival came to take precedence over cleanliness. Populations massed, as destitution increased, around food-distribution sites such as soup kitchens and workhouses and as evicted tenants clustered in the houses of friends and relatives. The major epidemics began in September 1848, the beginning of a particularly and unusually harsh winter in Ireland. At this point in the famine, work on the public roads was a major source of relief, which entailed exposure to the unusually harsh winter weather in spite of the debilitation caused by hunger and inadequate clothing. These factors caused a general increase in lice infestation and susceptibility, igniting nationwide epidemics which continued in parts of Ireland as late as 1851 (MacArthur 1957).

Relief in Ireland was handled as an internal matter by the English government, since Ireland was then part of Great Britain. By both the standards of the times and by contemporary experience, given the experience of relief in the Sahel, the relief effort was

well-administered, although there was a remarkable reluctance to accept the severity of the famine. There was some evidence of bureaucratic ineptitude, but the major impediment to effective relief in Ireland was a remarkable devotion to the principles of laissez-faire capitalism. The most dramatic evidence of this devotion was provided during 1848, the worst year of the famine. During that year food was sold from government relief stocks at a price 5% above that sold through private merchants in order to protect private profits, even though people were starving not because food was not available but because its price was beyond their means. Consistent with this ideological orientation, relief was administered through two major programs: workhouses established by the Poor Law and public works programs administered by the Board of Works. As the casualty figures attest, neither was especially effective, and these programs often exacerbated the suffering already present. For example, the workhouses were financed through local taxes. As destitution increased and the costs of administering workhouses rose, taxation increased as the ability of tenants and cottiers to pay them dissipated. This caused evictions, increasing the number of destitute without increasing collections. Opportunities to work on the public works projects was largely restricted to able-bodied men. Work was on a piece-work basis, and the workers were often so weakened by hunger they could earn little. Neither system regularly assisted the young or infirm: in some cases, young and infirm inmates of the workhouses were ejected in order to make room for the able-bodied destitute (Woodham-Smith 1962). In spite of these limitations, substantial numbers of people received food distributed through government channels. On balance, however, relief conducted in accordance with the principles of

laissez-faire was a miserable failure (Mayer 1975).

Beyond the reduction in the Irish population through emigration and death, the most lasting effects of the Great Hunger were the changes it wrought in the structure of the rural population and the foundations that were laid for the great colonies of overseas Irish. The laboring and cottier classes were virtually eliminated by the famine, and the forces which were released as a result of the famine caused the later decline of the small landholder. The great bodies of Irish immigrants in North America have had profound impacts on the course of Irish history and Anglo-Irish relationships. Even more significant, perhaps, was the legacy of hatred the famine left behind. "Between Ireland and England the memory of what was done and endured has lain like a sword (Woodham-Smith 1962: 412)," and the death and suffering which persists today, in Ulster and even in England itself, is at least in part a legacy of this famine (Edwards & Williams 1957, Woodham-Smith 1962).

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In spite of obvious differences in total mortality, culture, and particular environmental stresses, a number of parallels are evident in these two human catastrophes. Most clearly, both famines resulted from quantitatively unusually severe stresses on human ecological systems which had lost their resilience to such stresses because of overpopulation. Drought was as common in the Sahel as potato failures were in Ireland: the factor producing severe famine was not the introduction of qualitatively new stresses, it was the loss of the land's capacity to absorb significant stress, given the extant subsistence patterns. The overpopulation in the Sahel was of livestock; in Ireland there was an overpopulation of human beings. In both cases, the land was not capable of withstanding ecological stress.

Both famines caused large-scale social disruptions whose effects were enduring well beyond the end of the crises. In the Sahel the Tuareg nation has been virtually obliterated and all nomad groups have suffered greatly. In Ireland three major social classes have disappeared. Although an evaluation of the Sahel cannot be made with certainty, it appears that both famines have left an enduring legacy of bitterness with the peoples who have starved and whose consequences have been the most persistent effect of the famine, insofar as Ireland is a valid example.

Finally, both famines have created a new and stable ecological balance. The elimination of the nomads' herds in the Sahel may reverse the desertification of the region, which has been its major threat for decades. At the very least it has been halted and the removal of the nomads' cultures may permit the introduction of a less destructive and more stable herding economy (Brabyn 1975).

The reduction of the population of Ireland was its most obvious and pressing need, and its need for a restructuring of its social and agricultural systems was scarcely less so. In view of the times and the strong aversion to emigration characteristic of the Irish before the famine (Woodham-Smith 1962), neither of these may have been possible by a less catastrophic means.

It is difficult to make generalizations about relief efforts from these two famines, since neither was particularly successful, at least in preventing death or social disruption. One observation might be made, however. Both Mayer (1975) and Sheets and Morris (1974) suggest that a supranational apparatus be created to more adequately deal with famine. The experience of the Sahel shows that bureaucratic ineptitude is as effective as ideological preoccupations in impeding adequate and timely response to famine. The FAO is a supranational organization, and it functioned little better than AID in coming to grips with the Sahelian disaster, even in its more circumscribed role. While the suggestion is laudable, the creation of such an agency will by no means insure that experiences such as those examined here will not be repeated unless some means is incorporated into such an organization to obviate bureaucratic ineptitude.

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THE ESTROGEN MYSTIQUE  
OR  
MENSTRUATION IN CULTURAL CONTEXT

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The biological basis of human behavior has recently been the subject of intensive investigation, especially within the framework of physiological psychology. On the other hand, psychosomatic medicine and the developing research on biofeedback mechanisms are more concerned with behavioral effects on biological mechanisms. Much of the insight gained in these studies has been considered by anthropologists in their analysis of cultural norms. One particular interaction of biology and culture will be discussed in this report, that of the menstrual cycle and the complexes of social behaviors related to it in various societies.

The existence of particular customs related to menstruation has been well documented in the literature of anthropology with perhaps the most extensive records summarized by Sir James Frazer in The Golden Bough (Gaster, 1959). For example, Australian aborigine women are forbidden during menstruation to touch anything that men use or to walk on a path used by men. In Uganda the pots handled by a menstruating woman must be destroyed, and Eskimos require the ritual purification of utensils used by a menstruating woman (Gaster: p.212). The Arapesh of New Guinea and some groups of North American Indians banned a menstruating woman to an isolated hut, while women in ancient Persia were restricted to a room at least 15 paces from the fire and water supply (Graham 1951:30). These restrictive prescriptions most often include avoidance of contact with a menstruating woman, varying from forbidding sexual intercourse with her to completely banning her from the community. Many of these taboos have been continued in one form or another

down to recent times and their residual effects appear to be widespread in the most modern societies.

Students of anthropology frequently encounter descriptions of menstrual taboos in the ethnographies of primitive groups. Several studies have been reported using the data from the Human Relations Area Files to determine the occurrence and correlates of menstrual taboos. One such study was that of William N. Stephens (1961) who analyzed 71 societies for the degree of manifestation of castration anxiety in relation to the intensity of menstrual restrictions. Using Freud's proposals for evidence of fear of castration (severity of sex training, punishment for masturbation, and the postpartum sex taboo), he found a strong relationship to the severity of taboos on menstruating women. By his reasoning, menstrual blood symbolized the blood of castration, leading men to fear menstruating women. Stephens tested several alternate explanations for menstrual taboos, as follows:

- a. a disgust reaction, connected with disgust for feces (but no correlation was found with severity of toilet training)
- b. abhorrence of menstrual blood per se (cultural "depressors" such as menstrual pads would eliminate the need for taboo, but some societies without pads have few, if any, taboos)
- c. taboo is a function of the status of women (but there is no correlation between extensiveness of taboos and rules of residence or descent or importance of women in subsistence)
- d. a historical accident, the extensiveness of taboos depending mainly upon borrowing or inheriting (true, but antecedent variables in the cultures studied are also similar)

In a later analysis of Stephens' data, Young and Bacdayan (1965) proposed a sociogenic rather than a psychogenic correlation. They concluded that social rigidity is a sufficient explanation for the occurrence of menstrual taboos. Social

rigidity is defined as the relative lack of communication among the parts of a social system and is a measure of the degree of cleavage among subsystems. They found a high frequency of occurrence of menstrual taboos in association with a condition of social rigidity. In 1967 Philip Bock criticized Young and Bacdayan on several points. He pointed out the high correlation of geographic area with the occurrence of menstrual taboos (Africa, the Americas, Melanesia) and proposed diffusion and culture history as key factors. He outlined the dangers of extracting social facts from their contexts before comparison and suggested the possibility of biased sampling techniques, e.g., what circumstances would lead Western ethnographers to report menstrual customs for a society?

The concept of the menstruating woman as unclean and dangerous to men is as old as historical records in Western cultures. Among the earliest written records on menstrual taboos are the biblical laws in Leviticus (Bullough 1973a:45). Stringent laws were given for the purification of women after childbirth and for ritual hygiene at the time of menstruation. These laws still influence the customs of Orthodox Jews and have undoubtedly played a role in the formation of Judeo-Christian traditions of Europe and America.

Thus, the biological fact of menstruation appears to have a significant correlation with several social facts or cultural norms in many different societies. So many cultures have prescribed restrictive behavior in relation to menstruation that groups lacking it may be considered unusual.

As with other bodily functions, understanding of the

menstrual cycle did not begin until the modern development of the sciences of physiology and biochemistry. In the 1890s the ovaries were first transplanted in animals, and in 1923 estrogen was first isolated. It was soon demonstrated that menstrual flow followed a drop in the estrogen level of the blood, but little more was understood of the entire cycle (Graham: 635).

A review of the attitudes of 19th century American physicians towards menstruation suggests the characteristic beliefs of even a relatively modern society (Bullough 1973b). At a time when women in Euro-American cultures were beginning to challenge the stereotypes about their status in society, several physicians published books and articles on the dangers of mental exertion for pubertal females. Citing cases of weakness, collapse, and insanity among girls attending boarding school, these physicians suggested that exertion of the brain interfered with development of the reproductive apparatus and they specifically asserted the need for long periods of rest during menstruation. The American physician of the late 19th century was generally aware of the theory that ovulation and menstruation were connected but still had little understanding of hormones. A large measure of folklore was still included in most speculations on sexual and reproductive processes. An influential theorist on the topic was Edward H. Clarke whose popular book, Sex in Education: or a Fair Chance for Girls , went through 17 editions in 13 years. Clarke's work was thoroughly attacked by his fellow physicians as unscientific, but it continued to have a wide influence for many years. His

principal thesis was that women could not be educated in the same manner as men and retain good health. Many other physicians jumped into the controversy, citing the evidence of weakness and disability confusing their political and social biases with objective findings. As Bullough points out (1973b:81), many of the physical symptoms reported could as well be ascribed to poor nutrition, tight-waisted corsets, and multiple heavy skirts as to any presumed disability related to menstruation. He continues "...obviously women are anatomically different from men, and they do have monthly periods, but to generalize from this and a few isolated patients a whole theory of female inferiority seems to be an example of poor medical theorizing. The difficulty with past medical theory, whether good or bad, is that it often remains a part of the popular ideology of a later generation".

In modern Euro-American societies there are apparently several interacting biological-behavioral factors at work in relation to the menstrual cycle: 1) a woman's attitude toward herself as a person, e.g., her body-image, her role in close interpersonal relationships, and her potential performance in the larger society; 2) a woman's concept of illness and health, e. g., her expectations of menstrual pain and distress, her reaction to menopause, and her judgments of factors in tension and depression; 3) the attitude of individuals in contact with a menstruating woman, especially her family and physician; 4) the attitude of society in general terms to the ramifications of menstrual cycle phase in relation to the behavior of women, e.g., employers and co-workers, educators, voters, and 5) objective data on the physiological correlates of biology

and behavior, e.g., scientifically designed studies of motor or intellectual performance in relation to phase of the menstrual cycle, or controlled studies of psycho-social factors affecting the cycle itself.

Self-image for a woman develops within the context of her culture and, with respect to menstruation, includes concepts derived from the tradition and folklore of her particular society. Although some members of Western societies consider science as only the newest form of folklore, it is apparent that accurate knowledge of human physiology has been a boon to the physical and mental health of many women. The physical emancipation of American women from the restrictions of the menstrual flow was given a major boost by the development of the sanitary napkin. It first appeared on the market after World War I as a result of the development of cellucotton surgical dressings. When the Kimberley Clark Company planned to market their new product, Kotex, the subject of menstruation had to be brought out into the open. Many imitators also entered the market and new products such as tampons and cups were introduced. One of the first effects was the shedding of heavy skirts and petticoats by women who no longer needed to mask the bulges and odors of the diaper-like pads of earlier years. This new physical freedom and improved hygiene undoubtedly had psychological effects and perhaps allowed some women to begin questioning their roles and potential performance in society in a new way (Bullough 1973a: 340.)

A woman's concept of illness and health as well as her actual physical feelings of well-being may be strongly connected to the menstrual cycle in her own mind as well as in the view of

those around her, whether they be her own family, her employer, her physician, or her track coach. For many girls the menarche or onset of menstruation is accompanied by feelings of fear and disgust reinforced by the use by her family or friends of such terms as "the curse" and by implicit or explicit anticipations of pain, discomfort, and moodiness on a monthly schedule. This type of conditioning has apparently produced in some women neurotic anxieties which enhance any physiologically based tension or discomfort. A brief review of the literature of psychology and psychiatry of women in the last 50 years can produce a wealth of material relating the menstrual cycle, menopause, and fluctuations in hormone levels to the occurrence of neuroses and psychoses, the incidence of suicide and accidents, and the level of female criminal activity (e.g. Balasz 1936; Birtchnell 1974; Chadwick 1932; Coppen 1963; Dickmeiss 1946; Eagleson 1927; Freed and Kroger 1950; Goldschmidt 1934; Healy 1928; Middleton 1934; Sowton, Myers, and Bedale 1928; Stern 1946).

Enough studies have been done to confirm the changing circulating hormone levels during the menstrual cycle, with estrogen at a peak near mid-cycle or the time of ovulation, and progesterone and estrogen both lowest just before or during menstruation. A great many women do report changes in mood and actions during the course of the cycle, but there is disagreement among researchers as to the number of women who report these changes, ranging from 15% in some studies to 95% in others (Paige 1973:41). Karen Paige conducted a study of menstrual distress among 52 women using birth-control pills. Even though the pill tends to minimize hormone fluctuations there were still variations in volume and duration of menstrual bleeding. Paige proposed that



menstrual distress may be a social response to menstruation itself rather than a physiological response to changing hormone levels. She reasoned that if premenstrual anxiety and depression are linked to the bleeding volume, then pill users with reduced flow should report fewer complaints than those with no change in flow pattern. Her study supported her sociogenic hypothesis that reduced anxiety was correlated with reduced flow.

An additional study was done by Paige (1973:45) to determine the relationship of religious background to menstrual complaints. Data were gathered through a questionnaire survey of 352 unmarried college women of known religious affiliation: Jewish, Catholic, or Protestant. Paige attempted to identify social and psychological factors related to menstrual distress, first by exploring the possibility that women use menstruation to "explain" discomfort or stress which in fact has other origins, and second, to investigate the relationship between menstrual distress among different religious groups and three dimensions of femininity. The femininity dimensions were given as follows: family and motherhood orientation; virginity or sexual experience; and menstrual social behavior; i. e., behavioral change and adherence to rituals. The results showed that women with physical complaints and psychological stress during menstruation tend to report similar symptoms when they are not menstruating. Each religious group was equally likely to report distress, but the origins and meanings of the symptoms differed. For the Jewish women the amount of distress was related most strongly to adherence to rituals and menstrual taboos, for Catholics the amount of distress correlated highest with an

index for family and motherhood orientation, and distress among Protestants was not strongly correlated with any particular social factor. Paige concludes that the traditionally feminine woman is most apt to suffer physical discomfort and psychological stress. She found no evidence to support theories that a woman's reaction to menstruation is a result of her early experience or of information she had received, and no evidence that variations in symptoms are related to physiological differences such as cycle length, regularity, or age at menarche. As she points out, all women exhibit hormone fluctuations during the cycle but not all have menstrual symptoms. She suggests that the problem should be studied more thoroughly in relation to cultural ideologies which narrowly define behaviors and emotions which are appropriately feminine. Her most recent research on a sample of 114 societies from around the world leads her to propose that menstrual taboos and rituals reflect a society's emphasis on sexual stratification, including specifically the control of women and their fertility (1973: 46).

Several recent reports and reviews have been published on the correlation of phases of the menstrual cycle with certain aspects of behavior: alcoholism, psychiatric symptomology, suicide, psychological states, motor performance, response to heat stress, and intellectual performance. The quality of these papers varies widely and summaries are presented here only as examples of the range of recent research.

In 1971 Belfer recorded the menstrual status and cycle phase along with other data from interviews of 34 alcoholic and 10 non-alcoholic women at a clinic. Sixty-seven percent of those still menstruating and 46% of those not menstruating related

their drinking to their menstrual cycle, all of these associating drinking or increased drinking with the premenstrual phase of the cycle. The alcoholics indicated a significant increase in anxiety and depression at the time of the interview, but their femininity scores were normal. Belfer suggests that acceptance or non-acceptance of feminine role behavior and perception of premenstrual physiological changes may be significant stress factors for alcoholic women.

Jacobs and Clark reported in 1970 on a study of 200 patients seeking psychiatric help at either a hospital emergency room or an out-patient clinic. They found a significant correlation between the request for psychiatric help and the phase of the menstrual cycle as follows: 24.5% sought help when menstruating, 22.5% sought help during the premenstrual phase, and 18% asked for help at mid-cycle. The menstrual phase was higher for the emergency room patients and the premenstrual phase higher among the clinic patients. The authors discuss possible causes for this variation related to the time and place of contact with the patient, but the thrust of their article was to alert the physician to record a patient's menstrual history carefully. They believe such a history can be useful for the physician in understanding patterns of disturbance or alterations of affect related to cycle phase.

A review of the literature on suicide in relation to the menstrual cycle was published by Wetzel and McClure in 1972. They summarized 23 studies into four categories: completed suicides, attempted suicides, and suicide threateners. They were critical of most of the reports either on the basis of biased selection of cases or of inadequate methods for determin-

ing the menstrual phase of the patient. The studies which they reviewed suggested a higher frequency of completed suicides during the menstrual phase and a higher frequency of suicide attempts in the late luteal and menstrual phases. They conclude that no adequate studies have yet been done, and predict that well-designed research will show that, for some suicidal groups, the phase of the menstrual cycle will be one effective predictor of the timing of a suicide attempt.

The concept of a premenstrual syndrome and psychological studies in relation to it were reviewed by Parlee in 1973. She divided these studies into four categories on the basis of method: 1) those collecting data on positive correlations between specific behaviors and the phase of the menstrual cycle; 2) those using retrospective questionnaires on symptoms and mood changes; 3) those employing daily self-ratings of moods, symptoms, and actions; and 4) those using thematic analysis of verbal material collected throughout the menstrual cycle. Parlee is critical of all of these studies for the lack of control group analysis and the choice of base lines for reporting behavioral changes. She points out the difficulty of relating psychological phenomena to specific physiological changes, and deplures the publication practices which limit the presentation of negative results in the literature. She cites the report of R. H. Moos that 150 different symptoms have been reported as associated with the menstrual cycle, and notes the conclusion of K. Dalton that the premenstrual syndrome has been taken to include recurrence of any symptom always at the same time in each menstrual cycle. Parlee says that, in spite of a lack of agreement on the precise nature or timing of the syndrome, a wide variety

of physiological factors have been proposed to account for it. She concludes that psychological studies have not established a class of behaviors and moods measurable in more than one way which can be shown to correlate with any particular menstrual phase for groups of women. In another study Parlee (1974) compared 34 male and 25 female undergraduates using the Menstrual Distress Questionnaire devised by Moos. The correlation of responses suggested to her an interpretation in terms of stereotypic beliefs about the psychological concomitants of menstruation.

As more has been learned of the cyclic nature of levels of circulating hormones, many studies have been carried out in different fields which attempt to correlate various physiological functions with cycle phases. Again the quality of such investigations varies widely and conflicting results are often reported. For example, in 1972 Wearing et al. studied the performance of a group of female intercollegiate athletes on a series of tests of physical fitness correlated with a record of their menstrual cycle history. They concluded that performance on the tests was best during the intermenstrual phases and poorest during the menstrual period. This study can be seriously criticized on several grounds: 1) the subjects knew the purpose of the tests in advance, 2) there was an opportunity for a practice effect to show up in the last repetitions of the same tests, and 3) no objective test of the menstrual phase or circulating hormone level was obtained. Also in 1972, an investigation was reported by Doolittle and Engebretsen on the performance of exercise tests by a group of non-athlete college women. They found no significant correlation between test performance and

cycle phase. Hormonal analyses were done on this group and they revealed a problem of correlation of day of cycle with phase of cycle. The degree of fluctuation in hormone levels between different individuals for the same cycle day casts doubt on the validity of any investigation based solely on the correlation of any behavior with the day of the cycle.

Two papers by Wells and Horvath exemplify the more sophisticated work being done in some physiological studies. In 1973 they reported research on response to heat stress in relation to the menstrual cycle. They found unusually high heart rates in women subjected to environmental heat stress as compared to men. It was found that menstrual phase has little influence on the ability to regulate body temperature. Total plasma proteins and hematocrit decreased and serum electrolytes increased, suggesting a net water influx into the vascular compartment in response to heat dehydration. They proposed that females adjust body temperature primarily through cardiovascular mechanisms involving compartmental fluid shifts, a situation which leads to the impression that women are more subject to circulatory collapse in heat. In a subsequent study reported in 1974 Wells and Horvath subjected a group of female subjects to exercise in a hot environment and attempted to correlate their degree of distress with menstrual cycle phase. No correlation was found. In this situation, apparently, the marked hemodilution observed during resting heat-distress was offset by a tendency to hemoconcentration which occurs following exercise dehydration under normal ambient conditions. These women showed considerable thermal strain which Wells and Horvath believe was caused by insufficient circulating blood to carry

out the transport of oxygen to working muscles and of heat to body surfaces.

The possible relationships of menstruation to cognitive and perceptual-motor behavior have been reviewed by Barbara Sommer (1973). She analyzed four classes of studies reported in the literature: 1) self-reports, in which between 8% and 16% of the subjects had reported they were aware of an impairment of cognitive ability during menstruation; 2) performance measures of physical fitness and coordination, in which little or no cycle effect has been demonstrated; 3) social behavior correlations such as crime statistics, factory absenteeism, or school disciplinary problems, which showed an increase during premenstrual and menstrual phases; and 4) central nervous system correlates which showed a direct effect of gonadal hormones on certain EEG changes (although these changes are not yet clearly related to any cerebral function). Sommer concludes that the responses in these investigations which are mediated by social and psychological factors are more likely to show changes related to the menstrual cycle. She recommends a further search for evidence of hormonal relationships to decreased performance, using a more intensive research design with smaller groups, and emphasizing women in the professions and in decision-making positions. In addition, she proposes further analysis of women's expectations about menstrual disability and how they are acquired, as well as studies of the psychosomatic aspects of cycle fluctuation.

One example of the effect of psychosocial factors on the menstrual cycle was reported recently by McClintock (1971). Citing the effects of pheromones on estrous cycles in mice,

together with anecdotal reports of menstrual synchrony among all-female living groups, she designed an investigation of the changes in menstrual onset dates of a group of 135 dormitory residents at a women's college, on the hypothesis that social groupings influence some aspect of the menstrual cycle. Data were collected three times during the academic year, including the onset dates of the previous two cycles, and the amount of social contact with males and with female room-mates and closest friends. Final results showed that through the year there was a significant increase in synchronization of onset dates between those individuals spending the greatest amount of time together. The amount of time spent with males correlated significantly with the length of the menstrual cycle (more time = shorter cycle), but this factor could not be shown to affect the synchrony pattern. After ruling out maturational factors and the possible influence of awareness of the cycle phase among friends, McClintock proposes that there is some interpersonal physiological process, perhaps the secretion and detection of a female pheromone, which affects the menstrual cycle.

Recent interest in biofeedback mechanisms, which enable some individuals to consciously alter body functions mediated by the autonomic nervous system, may bring a new perspective to the interaction of mind and body in relation to the menstrual cycle. Explanations of such interactions have been proposed before, but there may soon be enough information on the physiology of the nervous system to justify and support a scientifically based body of knowledge to replace the mystique and myth of menstruation in its cultural context.



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HUMAN VARIABILITY:  
A Discussion of Life-Span and Longevity

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It has often been said that the only certainty in life is death. We are all going to die sometime, so it just remains a question of when and how. Because death is something we are all faced with, there seems to be a universal interest in it. Our conceptions of death are intricately related to our ideas about life, including our attitudes toward old age. Alex Comfort has suggested that, "Our reaction in this culture to old age, as to death, is one of anger and outrage, in a way that hasn't been true in previous cultures." (Comfort:1970). Reflections of this may be seen daily in our dress, our language, and even in our physical appearances. It is not uncommon for women, or for men either, to dye their graying hair, to wear youthful styles of clothing, and to utilize words and phrases common in the conversation of the young in order to disguise the fact of their aging. This has even been carried to the point that face lifts, to remove the wrinkles of age, are not viewed as being particularly extreme.

The reasons for these reactions are tied to both our own cultural background and also to apparent universal ideas about life. We are definitely a youth-oriented culture. This is in part, no doubt, due to our basic acceptance of the Protestant work ethic, and the belief that to be useful we must work. Those who don't work don't command the respect of much of the remainder of society. Inability to work is associated with the physical results of aging, so perhaps denial of aging is a defense against the prospects of the forthcoming loss of status.

On a broader scale these reactions may be attributed to the fact that all societies value life and seek to prolong it

(Cowgill & Holmes: 1972). But it should be noted that we seek to prolong the period of our active lives and not our period of disability.

Interest in long life is also cross culturally evident in the form of legends and folklore. There seems to be two common themes: the "antediluvian" theme and the "hyperborean" theme (Cowgill & Holmes: 1972). The former suggests that in the past people lived much longer. A good example of this may be seen in the Judeo-Christian religions. The Old Testament writings of the Bible often make reference to the extreme ages of some of its characters. This is sometimes referred to as the Methuselah theme. The second assumes that in some remote area of the world there are contemporary people who hold the secret of long life. There are many people today who do not hesitate to accept this as fact. To support their arguments they point to the numerous newspaper and magazine articles that picture the elderly inhabitants of Vilcabamba, Ecuador; Hunza, West Pakistan; and the highlands of Georgia in the Soviet Caucasus. The validity of this theme as well as the reports cited to support it will be discussed later in this paper.

Prior to this, it might be helpful to explain the use of several terms. Cross-cultural comparisons have revealed variations in both life expectancy and longevity. Changes have been noted within the same culture with the passing of time, often leading people to conclude that man is living longer now than he did in the past. This is correct, to some extent, but there is a tendency to confuse the issue here. For example, the fact that life expectancy in the United States has increased by 24

years since 1900 does not mean that people are living that many years longer, but that more people in the population are living to old age thus raising the mean or average for the entire population. The life-span of man then has not increased, but his expectancy has. Life-span as defined by Louis Dublin is the limit beyond which human life does not extend even in the most favorable circumstances (Dublin: 1952: In: Lansing). This limit represents man's biological potential, which is considered to be somewhere around 100 years.

The importance of recognizing these differences is apparent when considering the implications of a change in either. The change in life expectancy in the United States has resulted from a combination of factors. Both the decline in birthrate, and the improvement of health care, decreasing the number of premature deaths, has brought an increase in the proportion of elderly in our population to 11% (Leaf: 1973). A change in life-span will only be brought about by the manipulation of the biological mechanisms of aging.

Cross-cultural differences in life expectancy and reported longevity have prompted questions concerning the existence of populations with a longer than average life expectancy and life-span ("hyperborean" theme). The Wichita Eagle recently ran a picture of a woman and her son who claim to be 140 and 100 years old, respectively (1974). In the last few years there have been numerous articles, both popular and scientific, reporting cases of extreme longevity. These reports prompted the implementation of intensive research methods in order that the secret of the longevity of these groups of people might be learned. Consideration was given to the possibility that their diet, the altitude,

their level of physical activity, or their heredity might play a role in their extreme longevity. Few would question that these aspects of culture have some degree of influence on longevity but there is doubt that these could bring about such a large increase.

Zhores A. Medvedev, a Russian scientist currently working in London, will not accept the implications of these studies. He proposes that the basis for the superlongevity is not attributable to biological differences, but to a complex social problem which has developed for social, cultural and political reasons (Medvedev: 1974). The similarities of factors between the societies in which the centenarians live does not seem close enough that their longevity should be ascribed to these. Furthermore, there are inconsistencies between the patterns of longevity in the three populations previously mentioned and those of the general population. Medvedev cites the following points as cause for suspicion:

1. These villages have more people in progressively older age brackets;
2. They showed a decrease in the percentage dying with each higher age bracket, contrary to the expected increase;
3. There were more superold men than women; and
4. The biochemical studies conducted showed that the function and metabolism of the 100 to 110-year-olds was on the same level as is normal for 55 to 60-year-olds.

Cowgill and Holmes report that the status of the aged is higher in less complex societies (Cowgill and Holmes: 1972). This could account for many of the claims and is proposed by Medvedev to be one of the probable reasons. Further, at least in the Caucasus, the fact that the Moslem calendar year is ten months long must also be noted. Political factors come

into focus when the emphasis the Soviets place upon these people, as examples of their social achievement, is evaluated.

The lack of adequate documentation of any of the super-old has been one of the primary causes for dissatisfaction with the studies. At present, the greatest authenticated report of old age in this country is 120 years (Comfort: 1964).

Medvedev's use of statistics to criticize the authenticity of the reports may not be valid, should a race genotype with twice the normal potential life-span exist. Comfort suggests that this would not be evident unless the distribution of ages is continuous.

When what is currently known about the processes of aging is considered, it becomes increasingly difficult for me to accept these and other reports of extreme age as having any biological basis. As is certainly apparent by now, any study dealing with longevity and life-span is inherently involved with studies in the processes of aging. Although when a person is considered old is largely determined by culture, the fact of biological aging assures that in each society there will be individuals who are considered aged. This state is generally accompanied by a decrease in strenuous physical activity, the acceptance of new roles, and change in the treatment accorded them by the remainder of the society (Cowgill and Holmes: 1972). These social changes result most often as a consequence of the changes in the ability of the individual to adapt due to decreasing physiological adaptability. In modernized societies, however, old age is signalled by chronological age despite physical condition.

E. W. Busse makes a distinction between two aging pro-



cesses: 1. Primary Aging, that is, those inborn and inevitable detrimental changes that are time-related but independent of stress, trauma or disease; and 2. Secondary Aging, or disabilities resulting from trauma and chronic disease (Busse: 1969). It will be seen later that these concepts determine the focus of the efforts being made to prolong life.

Most of the studies concerned with process are oriented toward primary aging, while studies of secondary aging are focused on the elimination of disease.

The following is a basic outline of some of the theories of aging as described by E. W. Busse (Busse: 1969).

1. Exhaustion Theory: An early theory based upon the assumption that all organisms contain a limited amount of energy which is gradually expended.

2. Accumulation of Deleterious Material: The assumption here is that pigments and other material accumulate in some of the cells, reducing their ability to function.

3. Deliberate Biological Programming: This involves the idea of built-in obsolescence. Accordingly, the life-span of the organism is limited by the durability of its parts; that is, the cells, tissues and organs.

4. Accumulation of Copying Errors: According to this model, life is terminated because cells develop copying errors which reduce the metabolic efficiency and interfere with their capacity for repair.

5. Cross-linkage or Eversion Theory: Cross-linkage between polypeptide strands results in a change in the structure of the collagen molecule, as well as a decrease in its elasticity.

6. Autoimmune Mechanisms: This proposes that with advancing age there is an accumulation of faults in the somatic cells, in the form of mutations. These mutations produce changes in the proteins, making them unrecognizable as a part of the organism and the body mounts an immune reaction to destroy what it mistakes as foreign matter. These are only a few of the many theories or models that have been developed. Even a quick glance at these reveals that investigations are being carried out at the cellular level. There are hopes that an understanding at this level will shed light on the mechanisms operating at higher levels in the aging process.

The basis for these studies lies in the work of Leonard Hayflick. Dr. Hayflick demonstrated that normal human and animal cells in vitro have a finite lifetime of 50 population doublings, taking about 10 months (Hayflick: 1974). Although these were in vitro studies, and no finite doubling process has yet been observed in vivo, the implications are interesting. He concludes that this finite lifetime of cells is a manifestation of biological aging at the cellular level.

The knowledge gained through the study of the aging process at the cellular level is being expanded in research and aimed at prolonging life. As I stated before, research is being carried out, focusing on both primary and secondary aging. Those interested in primary aging suggest that the increase in life-span that may be realized by curing the major diseases causing death, is not large enough to have any profound effect. Those interested in secondary aging, on the other hand, doubt that research in primary aging will come

up with any breakthroughs in the near future, but, if they should, they suggest that if implemented, its cost would be prohibitive for the average person.

I shall first consider the work of the researchers concerned with secondary aging. Alexander Leaf proposed that if science could prevent arteriosclerosis, hypertension and cancer, the life-span would be pushed closer to the biological limits (Leaf: 1973). There is little doubt about this, but its significance may be questioned. The effect of such a breakthrough would be a healthier old age, but it could hardly set back the limits of our life-span. Once again the primary effect would be upon life-expectancy rather than life-span. Hayflick produced the following table which illustrates how the elimination of ten of the causes of death would affect life expectancy at birth and at age 65 in the United States.

Table 1. Gain in Expectation of Life at Birth and at Age 65  
Due to Elimination of Various Causes of Death

| <u>CAUSE OF DEATH</u>                                      | <u>Gain in Years in Expectation of Life if Cause was Eliminated</u> |                  |
|--|---|------------------|
|  | <u>At Birth</u>   | <u>At Age 65</u> |
| Major Cardiovascular-Renal Diseases                        | 10.9  | 10.0             |
| Heart Diseases   | 5.9   | 4.9              |
| Vascular Diseases affecting the<br>central nervous systems | 1.3   | 1.2              |
| Malignant neoplasms  | 2.3   | 1.2              |
| Accidents excluding those caused by<br>motor vehicles      | 0.6   | 0.1              |
| Motor vehicle accidents                                    | 0.6   | 0.1              |
| Influenza and Pneumonia                                    | 0.5   | 0.2              |
| Infectious diseases (excluding<br>tuberculosis)            | 0.2   | 0.1              |
| Diabetes mellitus  | 0.2   | 0.2              |
| Tuberculosis   | 0.1   | 0.0              |

A quick glance at this table shows that the elimination of all of these causes of death would result in an increase in

life-expectancy by 22.6 years at birth and 18.0 years at age 65.

Research is currently going on also which is primarily concerned with finding ways of slowing down the rate of aging. Experiments in this area have included attempts to increase longevity by lowering body temperature, by introducing antioxidants and immuno-suppressive drugs, and by restricting caloric intake.

Leonard Hayflick's discovery that cell cultures could be frozen for apparently indefinite periods in liquid nitrogen, and then thawed without altering the doubling process, has prompted study in the area of cryobiology. Although the preservation of whole tissues, organs or animals, through this process, has not yet been achieved because of problems related to crystalization. There are a few people, twenty as a matter of fact, who have chosen not to accept death (Kowet: 1974). These twenty people made arrangements that after their death, their bodies were to be chemically treated and frozen, in the hopes that at some time in the future a discovery would be made, in whatever the field pertaining to their causes of death, and they might then be thawed and their lives restored.

The problem with this, thus far, on the cellular level, has been related to the damaging effects of freezing (Chemistry: 1974). Fast freezing increases the chances of ice forming within the cells, causing cell membranes to burst. Slow freezing results in the formation of ice outside rather than inside the cell. When this happens, salt concentrations outside of the cell increase and the cell releases water in order to maintain osmotic equilibrium, thus resulting in the buildup

of lethal levels of salt within the cell. The emphasis now is to find cryoprotectants, solvents that are virtually unfreezable, that will prevent cell damage caused by crystallization. Those presently available are not able to penetrate large cell masses (Hayflick: 1974).

Another problem has arisen due to the fact that different types of cells have different rates of survival at the different freezing rates (Chemistry: 1974). This makes successful freezing of the entire organism doubtful at this time.

If Hayflick's statement that manifestations of age and death are due to a loss of cell function rather than cell division then perhaps some of the damage caused in freezing the organism might be repaired (Hayflick: 1974). This, of course, would not be true for non-reproducing cells, as are found in the brain. It has been reported that a cat's brain was frozen six months, thawed and tested for electrical activity. The fact that such activity was observed suggested to some that organs could be frozen and thawed with little damage to them. Dr. King has pointed out however, that the enzymes in frozen tissue may be unaffected and will produce electrical activity in a thawed brain when the vital cells are dead (King: 1974: In: Kowet). In fact, Peter Mazur of Oak Ridge National Laboratory has said that whole organs, which thus far have been subjected to freezing and thawing have been nonfunctional or have shortly become so (Mazur:1974: In: Kowet). Successful reviving then seems to be quite a way off in the future.

Hayflick's studies may also have prompted the research currently being carried out in search of a drug which will

reduce the core body temperature. Barnett Rosenberg of Michigan State University explains that by lowering the body temperature the aging rate is also slowed (Kansas City Star: 1974). Experimentation in this area has thus far been restricted to mice. Rosenberg does suggest, however, that if these tests are successful, they might be tried on humans within the next ten years. Their effects upon life-span have projectively been attributed various levels of success. While Rosenberg states that a change by twelve degrees Fahrenheit would result in a life-span of approximately two hundred years, Strehler suggests that a change in only two degrees Centigrade will result in a twenty-year extension (Strehler: 1970). It is doubtful, taking the individual variability in core body temperature into account, that lowering the temperature two degrees will have any detrimental effects.

Other studies have focused upon other manipulations. Vitamin E is a natural anti-oxidant, which is said to perform an important role in the maintenance of cellular function (Strehler: 1970). The addition of anti-oxidants to the diets of study mice has produced an increase in longevity. Interestingly enough, one of these was BHT, which is used as a food preservative in many items available at the supermarket.

Studies with mice have shown that a diet restricted in caloric intake, during the early periods of life, will increase longevity by as much as 20% (McCay: 1952: In: Lansing). This also results in a slower rate of maturation. Figures, concerning caloric intake in the villages claiming extreme longevity, also indicate that low consumption might be preferable. Even

if the inhabitants are not as old as they claim, there is still some relevance to this issue, as they are obviously elderly.

These studies and observations have implications for our cultural practice of over-feeding children. They are reaching maturity earlier no doubt, but their acceptance of social responsibility is delayed, often until after college. The conflict between biological and social maturity has created problems for many individuals. Perhaps a return to restricted caloric intake might produce a swing back to later maturation and increased longevity.

Nevertheless, any increase in either life-expectancy or life-span will have a marked effect upon our culture. A change in life-expectancy will result from an increase in the proportion of the old aged. A large enough change might result in a shift in the general ideas of the population, as the elderly often have a conservative influence. A change in life-span, however, will likely come as a breakthrough. The aim of such research is the extension of the active middle years, not the older period of disability. An increase in life-span extending the middle years will have different social results than a comparable increase in expectancy.

Bernice Neugarten has predicted that even an increase of only five years will have a profound effect upon economic and welfare institutions (Neugarten: 1972). With people living longer and having prolonged middle years, there will be more people in the job market than can be handled, at least if our present circumstances are any indication. Some sociologists suggest that for this and other reasons there will also

be a power conflict between the young and old.

Another point of interest will be its effect on rates of change. If the life-span is sufficiently extended, then perhaps people will feel less pressured to make instant decisions, taking a little longer to think things through.

There are bound to be difficulties in implementing these programs. Richard Zeckhauser warns that the practical approach will be to consider all the effects before activating any programs, but taking a realistic view at our past, he suggests that we will go ahead whether or not the long term effects are worth the cost of transition (Zeckhauser:1974).

This raises questions of policy concerning who is to receive treatment and how it will be paid for. It has been estimated by Wheeler that costs for therapy could range from \$2000 per year per person to \$20,000 per year per person (Wheeler: 1970). If the cost must be paid by the individual, then there will be the obvious problem that treatment will be restricted to the rich. This suggests the possibility of some type of federal aid.

In the state of Kansas, the proportion of elderly in the population is 12.4%. Birren has estimated that in Kansas alone, by 1980, in order to meet the needs of the aged, 13,000 new trained personnel will be needed (Hays and Mullikin: 1975). In order to help meet these needs, Wichita State University has developed a field major in gerontology, aimed at providing an interdisciplinary training to those interested in the problems faced by this increasing population. It seems inevitable that similar programs will be developed at other institutions



in this state and others as well in the future.

It will be interesting further, to observe how the distribution of the knowledge will be handled. The effects on societies at different levels of complexity should be varied, since our concepts of who constitutes the aged population and our attitudes toward them are culturally determined. For example, the change in life-span and the proportion of the population living into old age may be very disruptive to the order of power in some societies.

It can be seen that there are cross-cultural differences largely influenced by cultural factors, and some degree of cultural difference in longevity. Considering the data, however, I doubt that there are, in fact, such wide variations in the potential life-span as claimed by isolated groups. On the contrary, there appears to be a biological basis for aging, which is much the same throughout the species, and which determines that even when all the cultural factors are at an optimum, there is a limited number of years that we can live.

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CULTURE, KINSHIP AND HUNTING

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## INTRODUCTION

Culture means many things to many people. To some, it is an adaptive process. To others, culture is the end result of adaptive process. But to most, culture is a definition of human behavior (a guide for potential action).

But what led to culture?

To A. Irving Hallowell, culture rose from a combination of actions and adaptations he refers to as protoculture. Protoculture appears, judging from a brief review of existing literature, to be discussed very little (Cohen 1974 :152). Why is this? Perhaps this problem arises from a failure on the part of scholars dealing with this subject to fully understand all it is and implies? Therefore, what I will attempt to do in the following essay is briefly define protoculture and from this definition, advance some thoughts on what and how protoculture became culture (Hallowell 1974:163).

Before defining protoculture, however, let us define culture as a basis for comparison. The following definition is taken from the July, 1975 issue of Current Anthropology in an article by Morris Freilich in which he defines culture as:

"Culture, Kluchohn and Kelly (1945:97) long ago taught, is best described as 'historically created designs for living, explicit and implicit, rational and irrational, and non-rational, which exist at any given time as potential guides for behavior (masks, totems, tools, weapons, etc.), and not necessarily rational (adaptive, functional, efficient, effective).' Culture is a potential guide for action; its mother is history or time and its father is continuity or order (Freilich 1975:208)".

Thus, it would appear that culture is a process etched in time with the defining element being order.

But then, where do these elements, time and order, 'fit-in' when viewing the ascent of man to a total cultural milieu? A. Irving Hallowell feels these concepts of cultural definition (time and order), are found in what he describes as protoculture (Hallowell 1974:163-164). But just what is protoculture? The following is a summary of Hallowell's definition:

Protoculture, first of all, is a hypothesis of what may have existed before culture (Hallowell 1974:163). Therefore, taking into account the elements of time and order, and the fact that protoculture is a hypothesis, it becomes apparent that what we are discussing is not concrete, but abstract, a process of transformation, like fire, that played a role as intermediary, as man emerged from nature to culture.<sup>1</sup> Hallowell feels then that protoculture is a process of adaptation (ibid:162). This adaptation is based on group value transmission and the continuity of these values by means of selection for intelligence (ibid:164). To Hallowell man's mental ecology is based on:

1. Brain-intelligence development
2. Speech-communication abilities
3. Kinship-groups aware of social ties; consanguinity/affinity, collaterals/generationals (time and order), and marriage
4. And a fourth element I will add, hunting as a way of life

However, as Y. A. Cohen so aptly reminds us:

"It should be reiterated that the concept of man's inheritance of such capacities from his prehuman ancestors in no way suggests that homo inherited specific modes of behavior from his nonhuman forebears, any more than one man's kinship with another is an index of their similarity (Cohen 1974:162)."

Essentially then, kinship and a greater need for social organization in regard to intelligence and the capacity for learned behavior took primates from a state of nature, through

the process of transformation referred to as protoculture, to a state of culture. Man no longer was an animal.<sup>2</sup>

#### HUNTING AS CULTURE

"Neither man's architecture nor his culture alone embodies his adaptive and evolutionary potential; both are required, and there is constant feedback between the two. Man's physical equipment could not have developed to its present level without culture, nor could man have achieved his capacity for culture without his physical evolution. Culture enables man to maximize his physiological potentials and to adapt to a variety of habitational conditions; it provides man with the potential for freeing himself from the limitations of his biology and habitat. With every major advance in his cultural milieu, man has capitalized on and exploited his ability to adapt, and in these terms Homo sapiens is the most advanced living form (Cohen 1974:158)."

Thus, to Y. A. Cohen, the ground work for man's ascendance to culture is steeped in an ancestry that led him (man), from a "natural" life to a "cultural" life. But what part did hunting play in this transformation? This question and the role of kinship vis-a-vis protoculture as a process of transformation are the questions I shall examine in the concluding section of this essay. Along with this analysis, some comments on hunting as a sacred commitment shall be noted as well.

Such a picture of culture emerging from protoculture is a product of the human intelligence adapting to the physical environment, to band, clan and tribal organization, to the division of labor in hunting and gathering, to long life and delayed immaturity, to the hunting of megafauna, dangerous to approach, living in herds in the open habitat -- in short, to an environment and a way of life, a culture of hunting.

Culture, kinship, and a social way of life were shaped by

the rise from an ancestry, through protoculture, to a full cultural milieu surrounding hunting. As Hallowell remarks:

"It was terrestrial living that provided the ecological framework of this development and, when the necessary psychological capacities, experience, and technological traditions had been developed, enabled the hominids to accelerate the behavioral differences between themselves and other primates by exploiting the resources of their environment through knowledge of it and a succession of discoveries and inventions (Hallowell 1974:166)."

Thus, natural selection for hunting has directly created the most subtle and delicate aspects of the cultural behaviors alluded to above. Now to the aspects of kinship and hunting, proper.

The approach is simple, as E. B. Taylor remarked, "... the simple, practical alternative (is) between marrying-out or being killed-out (Tylor 1888)." Thus, the theory of exogamy is a starting point.

Our paleolithic hunting-and-gathering bands--patrilocal bands in all probability (Keesing 1974)--exchanged women in order to live at peace with each other. If it were made a firm rule that no man of the band must marry any woman of it -- or rather that each man should marry a woman of some other band, then each band would become dependent on the other bands for marriage partners. This would form bonds of alliance between the bands. They would enter into a connubium -- a system of marital exchanges. Thus, two categories of bands would be set up: those with whom we had a connubium, and those with whom we did not.

This theory of exogamy then, was part of the transformation (protoculture), that led to a cultural lifeway for man. In



other words, what comes out of this theory of exogamy is that the exogamic rule is a positive rule for regulating relations between descent groups by means of connubium. But one might ask why they could not have exchanged something else besides women? The answer to that may be fairly obvious, there was little else to exchange! These were hunters and gatherers, not merchants or traders; they had their weapons and their skills which were not exchangeable, and their women who were. The hunting-bands of males stuck together but one woman was very much like another -- her skills were transferable -- so it was she who was passed on in exchange for another.

We cannot of course know exactly why the earliest groups of men decided to exchange women, but we can perhaps see the consequences of their not doing so. Pre-human primate groups are obviously well-ordered internally (Jolly 1974) -- the dominance hierarchy sees to that; but relations between primate groups are either non-existent, unordered or plainly hostile (Jolly 1974). At the sub-human primate level, this does not matter much, but with the advent of man the organized predator, things changed. The weapon is to some extent the characteristic of man that noticeably changed this relation. Relations between non-weapon bearing bands of apes are bad enough (Jolly 1974), but with the advent of the hand-axe and club (among other weapons), and the large cunning brain that went with them, there must have been a danger that protohuman groups would rapidly extinguish each other. If they were to exploit the same area (habitat), then they had to come to some agreement: form some relationship other than the simply hostile relationship. Nature had already provided within the structure of primate bands, the ideas of sharing and cooperation;

the basic idea of reciprocity seen most often in the activity, among primates, of mutual grooming (Jolly 1974). This concept only needed to be extended across the band boundaries to provide for some form of inter-band cooperative relationship. In other words, you would not try to exterminate a band whose wives were your daughters and whose daughters were your potential wives; you would become, in one sense at least, one people; you would be dependent on each other for your continuity and survival.

All species which develop fighting instincts and efficient means of killing in the struggle for survival, have the problem of not using these means to wipe themselves out in intra-species warfare (Lorenze 1963). Nature develops many means to this end, and exogamy (kinship), was the human species' answer to the universal problem. In that it had survival value, it flourished. Larger and larger groups of cooperating hunting bands exploited larger and larger habitats, with little or no hostility toward others.

#### THE ECOLOGY OF HUNTING-GATHERING

Most of what we know of a true human ecology is of an empirical nature. In the past, faced with the vast complexity of human behavior, in a socio-biological sense, classifying and describing was the common approach. In fact, until a considerable amount of this work had occurred, it was impossible to erect a valid theoretical framework. It was not until the twentieth century that the basic laws of natural selection (evolution as process) and the accumulation of ecological facts became sufficient for the formulation of general hypotheses. However, it is now possible to state that man's present ecological dilemma is the direct result of alienating himself from the only way of life he

has ever known, hunting, in the only space he is conscious of, the habitat, and in his only time, the Pleistocene. Deprived of these defining features, man is not fully human.

What in effect is basic to this or any other discussion surrounding hunting as opposed to not hunting (the goal of domestication), is that one group exposes a position of interpretation of life-nature-human ecology as being man-centered. These are the agriculturalists; whereas, in the case of hunter-gatherers, life to them is not man-centered. Paul Shepard states in his introduction to the English translation of the monumental work, Meditations on Hunting, by the Spanish philosopher, Jose Ortega y Gasset:

"Comparative studies of many different primates suggest parallels to the prehuman situation of our evolution and the steps by which social, intellectual and even ethical traits came into existence in an ecological context associated with the human animal's niche and, more particularly, his place in the paleolithic food webs (Shepard 1972:12)."

We are gradually accepting our form and physiology as that of a long-distance running hunter. The process of evolution selecting for knowledge orally transmitted, and the development of the human memory as a connecting intermediary, transforming the time and space of the hunter as he moves through his habitat, fulfills the realization that reality is a continuum of persistent process and that knowledge, in whatever form, is made up of the same reality. This includes death as well as life. To hunters such cultural subtleties are revealed in the kill. The paradox being, that in the moment of death, life is perpetuated. From this point culture takes over. And as a process is both self-fulfilling and self-sustaining. It assumes the role of mediator between life and death.

Therefore, man-centered philosophies only produce ideologies which in effect are not only useless but for the most part, meaningless. Thus, as Ortega y Gasset states, "Man is an animal, but something more than an animal, too". Ortega notes that man is trying to become an animal. As Ortega remarks, "Man has never really known what an animal is." Defining then, ecology as the study of predator/prey relations in the food chain, it should be realized that man is only human when he hunts. And I would add, sanctifies the process of hunting by preparing and eating the animal he has killed.

Life not only becomes, but is sacred. Culture provides the vehicle through which this sacredness may be both realized and perpetuated. In this life then, is found all that is human. Paul Shepard states:

"The hunter's vision is itself a part of nature. His perception of the signs of passage and the signals of events is continuous with those events. His eye roves across a landscape which is itself living. The hunger in man lives an eventful life, a present, sound-filled pulse which collectively is the dynamic, oral, traditional society, where the poet is historian and men are bound in myth and music to a generous and religious existence (Shepard 1972:14)."

It is exactly this "generous" and "religious existence" that hunters profess is at the center of their universe. This life is sanctified in what I describe to be, 'a sacred commitment to hunting.'

#### CONCLUSION

Thus, man the cultural hunter became man the cultural creature. This was the direct result of the process of protoculture being selective for intelligence and the knowledge intelligence was capable of transmitting over the generations (vis-a-vis kinship).

In closing out this essay, a brief quote from Paul Shepard might be appropriate to our synthesis at this juncture:

"A view of man so humble in the scale of nature and so audacious in its challenge to the homocentrism of our traditional philosophy will not be easily accepted. Yet, like the idea of ecology -- indeed, as part of ecology -- it will in time reach out to all areas of concern and thought.

First, however, it must penetrate the husk of 5,000 years of 'civilized' (my own emphasis) fear and hostility toward nature in general and hunter-gatherers in particular. Only when our culture accepts the needs of living men as shaped by a prehistory which is still urgent in them, communicated to each by his chromosomes, will we be ready to follow the lead of Ortega's 'Meditations on Hunting' (Shepard 1972:15)."

Kinship then, as it was directed by hunting as the organizing principle of a cultural setting, took man from his pre-human state vis-a-vis the process of protoculture to a fully cultural way of life.

NOTES

1. As C. Levi-Strauss uses this dual contrast.
2. The use of the word "animal" is meant to relate to the more natural state of instincts, genetically transmitted in animals, than the culturally transmitted behaviors learned in man (Dobzhansky, in Hallowell 1974:171).

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