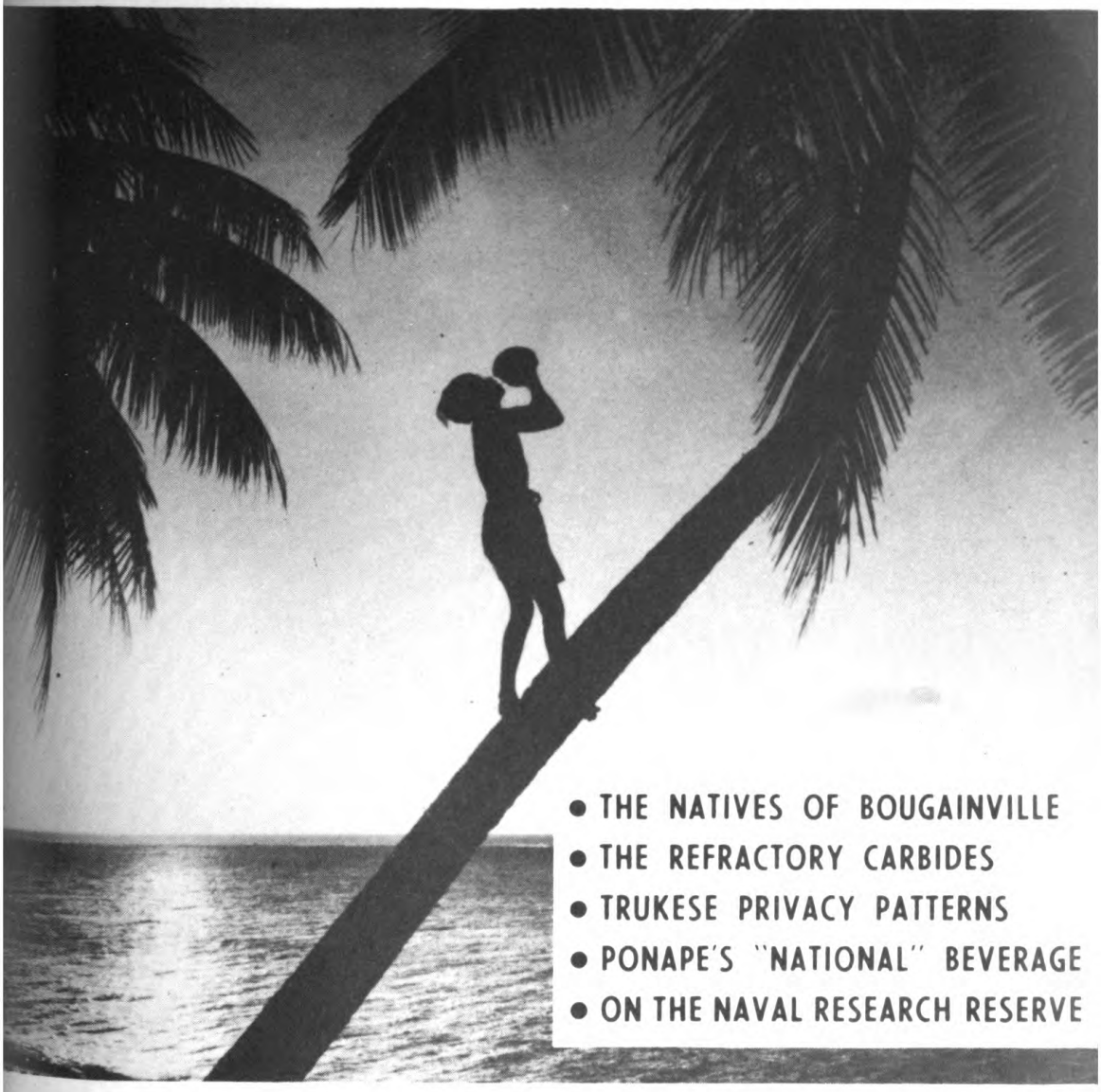
JULY 1950

RESEARCH REVIEWS



- THE NATIVES OF BOUGAINVILLE
- THE REFRACTORY CARBIDES
- TRUKESE PRIVACY PATTERNS
- PONAPE'S "NATIONAL" BEVERAGE
- ON THE NAVAL RESEARCH RESERVE

OFFICE OF NAVAL RESEARCH
DEPARTMENT OF THE NAVY
WASHINGTON, D. C.

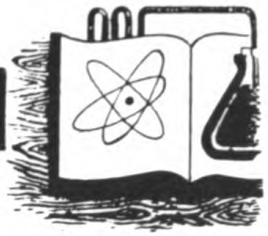
NAVEXOS P-510

COVER PHOTO: A young native of the Marshall Islands, perched nimbly on a tree trunk, enjoys a refreshing draught of coconut milk. Another drink popular in Micronesia (where ONR is supporting a number of research projects) is discussed in "Ponape's 'National' Beverage" on pp. 16-18, this issue.

Approved by Bureau of the Budget, 13 April 1948.

RESEARCH REVIEWS

● *Informs the Fleet of ONR-sponsored Research*



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Editorial Notes

One of the gravest military problems faced by ONR investigators--improving the reliability of electronic equipment--was emphasized recently in a symposium held at the Department of Interior. Leaders of the electronics industry, including representatives of the IRE, AIEE, and the Radio Manufacturers' Association, met with personnel of the Department of Defense and the Bureau of Standards to discuss a common aim: the attainment of electronic equipment which will be effective under combat conditions.

Speakers at the symposium hammered at one salient fact--that it is futile to continue to produce intricate electronic equipments which have a low order of reliability. Unless dependability and ease of maintenance are somehow achieved, a stalemate threatens to halt progress in this field which is so vital to the welfare of the Nation. The cost of maintenance of unreliable electronic equipment is staggering; such expenses may range from 10 to 100 times the cost of acquiring the original equipment. Obviously such expenditures--particularly in terms of manpower in wartime--are a tremendous drain on the Nation's resources.

Mr. L. V. Berkner of the Carnegie Institution of Washington termed the problem of obtaining reliable equipment "a military dilemma" and had the following suggestion to offer as a means of solving it: "...bold steps must be taken if we are to correct this already impossible situation...it is obvious that the first requirement for the production of reliable equipments is a re-orientation of thinking and universal acceptance of the belief that they can be produced...High levels of creative thinking must be brought to bear with ensuing revolutionare changes in design and construction techniques."

This, then, is the aim of ONR's "Program Analysis in Electronic Maintenance Minimization". The work is being carried out through contract with the Stanford Research Institute, under Dr. Cledo Brunetti, Associate Director.

Although, at first glance, it may appear that the ONR program attempts to solve an engineering problem of gigantic proportions, analysis of the situation indicates that the difficulties are not insuperable. It is not unreasonable to segregate into three areas the factors that, from design considerations, make up reliability--i.e., reliable components, reliable design, and reliable production. Since reliable components will be achieved only through long-term programs of design and development, now being conducted by Government and commercial interests, it was determined that other investigations could be more profitably undertaken in the ONR program. These investigations, then, are directed toward criteria for reliable design and for reliable production of electronic equipment. Reliable components are not excluded, but consideration is confined to defining research needs rather than actually entering into research programs.

The first report on this project--a survey of currently available, high-quality components--is now in process of publication. As further significant progress is made, other reports will be forthcoming; whenever possible, these will be unclassified to permit wide dissemination of vital information to the electronics industry. Thus, by filling a gap in a program of essential electronics research, ONR hopes eventually to help the Navy and the Nation to the attainment of tremendously increased security.

The Natives of Bougainville

by
Douglas L. Oliver

ONR is sponsoring a project at the Peabody Museum, Harvard University, under the direction of Dr. Oliver, to analyze somatic data on Bougainville and Motuna, and to investigate correlations of this data with other types of information available on these islands. Although no conclusions will be presented until a later date, when all the data have been statistically analyzed, it was felt that a description of the project would be of interest at this time. The following article provides such a description.

Prewar Bougainville Island was one of the best laboratories in the world for the study of somatic variability in relation to environmental, genetic, and cultural factors.

The 39,000 natives of this 130-by-30-mile island dwelt in settings ranging from sea level to slopes halfway up the 6,000 to 10,000 feet high mountain ranges. Each one of the Island's 17 ethnic groups was settled in one of three kinds of sharply contrasting environments: sandy beaches with sparse strand vegetation; gently sloping, low altitude alluvial plains with tropical rain forests, and high mountain ridges with mossy-bamboo forests. Each of these settings provided differences in soils, in temperature, in rainfall, in exposure to actinic rays, in prevalence of anopheles, in access to the wild foods which contributed importantly to diets, and in other ways.

Genetically, each of the 17 ethnic groups is thought to contain varying ratios of Negritoid, Australoid, and hybrid Mongoloid racial elements; and nearly every distinct group has attained some degree of homogeneity through long isolation and inbreeding.

Culturally, there is considerable variation between ethnic groups in terms of subsistence (including diet), muscular activity, hygiene, and general living conditions. For example, beach-dwelling Torau adult males eat fish daily, sleep in well-ventilated houses, and spend most of their waking hours in vigorous exertions in the sun--fishing, swimming, and paddling their canoes. Their inland Motuna counterparts, on the other hand, subsist on an almost completely carbohydrate diet, sleep in airless, smoky, filthy houses, and exert themselves only desultorily--building garden fences and hunting in the heavily shaded forests.

In the course of the Peabody Museum anthropological expedition to Bougainville in 1938-40, the author collected geographic, somatological, and cultural data from 12 of the Island's 17 ethnic groups,

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Douglas L. Oliver, after receiving his A. B. degree from Harvard University and his doctorate from the University of Vienna, served as a research associate in Anthropology at the Peabody Museum. He was a Social Science Research Council Fellow from 1941 to 1942 and during the war years became an economic analyst in Washington. He now lectures at Harvard University and is a consultant of the State Department.

representing all of the major types of environment and probably all of the racial components which went into formation of the Island's native population.

In Motuna, the most intensively studied ethnic group, exact schedules and diaries of daily food consumption and daily work activities of sample individuals were recorded over month-long periods. Sixteen months' residence in native villages permitted the author the closest kind of observation of other factors in native life pertinent to human ecology. In this group of 4,650 natives, systematic anthropometric and

Figure 1. Natives stage a show for visitors on Bougainville.

Figure 2. Tall-statured native inhabiting eastern coastal area

Figure 3. Women of the island

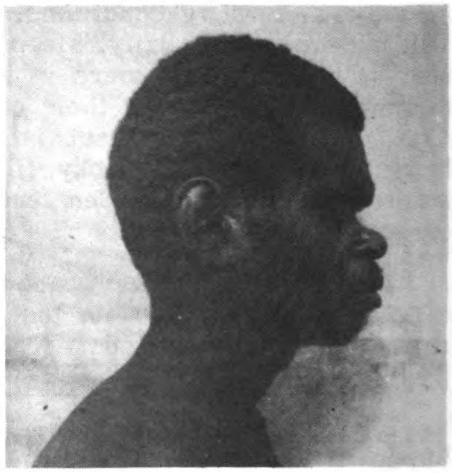

Figure 4. Pigmy-type native of mountains of central Bougainville

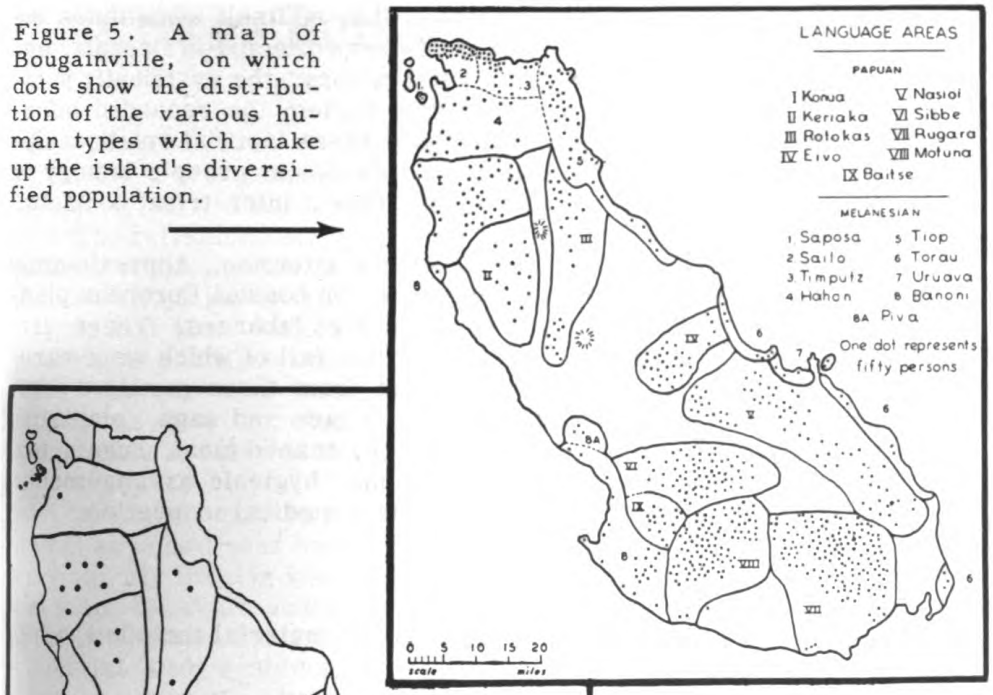

Figure 5. A map of Bougainville, on which dots show the distribution of the various human types which make up the island's diversified population.

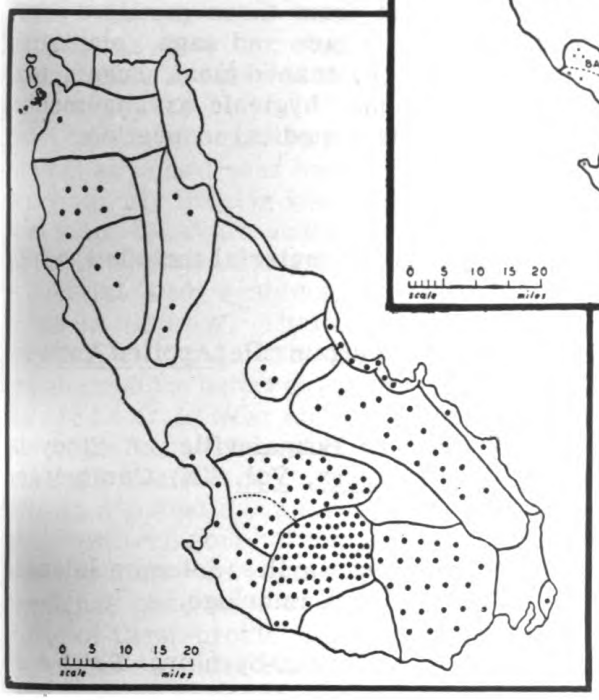

Figure 6. Here the distribution of the author's samples is indicated by the dots, each of which represents ten males.

morphological observations were carried out (including a count of dental caries) on 700 males ranging from ages 10 to 70. The age range was thus extended in order to evaluate the degree to which age influences bodily characteristics, thereby permitting this group to be used as a control in relation to other groups measured. Also, in addition to his standard census material, the author's data on Motuna include information, from personal and official reports, on the incidence of disease, and on fertility and morbidity (by age groups) during the decade preceding the study.

Material on the other 11 ethnic groups studied by the author is in all cases sufficient to make meaningful somatological and ecological comparisons starting with the Motuna data. In the Torau group, for example, only 80 adult males were measured, but these represented 12 percent of the total Torau population. During the shorter periods spent with these other ethnic groups, the investigations were pointed directly to the ecological relationships under consideration.

A comparison of the accompanying maps (Figures 5 and 6) will indicate the extent of anthropometric coverage. Some 2,000 males in

all were photographed and examined. This in itself constitutes the largest and most representative sample ever collected in Oceania, and its value is enhanced by these additional factors: the systematic sampling of different age groups in the control series; the recorded information on tribal, community, and in many cases familial relationships of each individual; and information on each ethnic group's history in terms of isolation, recent migration, and recent inter-tribal contacts.

One feature of the data deserves special attention. Approximately 25 percent of the individuals were examined on coastal European plantations where they were employed as indentured laborers. There, living conditions, diet, hygiene, and occupations (all of which were carefully investigated) were radically different from those in native communities. For example, in place of native taro and sago, plantation laborers ate strictly rationed meals of rice, canned meat, sugar, tea, and marmite. Also, their living conditions, hygienic arrangements, and state of health were subjected to constant medical inspection.

Publications on the author's Bougainville material include the following:

A Case of a Change in Food Habits in Bougainville; Applied Anthropology, Vol. 1, No. 2, Boston, 1942.

The Homomorun Concepts of Southern Bougainville: A Study in Comparative Religion; Peabody Museum Papers, Vol. XX, Cambridge, 1943.

The Peabody Museum Expedition to Bougainville, Solomon Islands, Peabody Museum Papers, Vol. XXIX, No. 1, Cambridge.

Human Relations and Language in a Papuan-Speaking Tribe of Southern Bougainville, Solomon Islands; Peabody Museum Papers, Vol. XXIX, No. 2, Cambridge.

Economic and Social Uses of Domestic Pigs in Siuai, Southern Bougainville; Peabody Museum Papers, Vol. XXIX, No. 3, Cambridge.

Land Tenure in Northeast Siuai, Southern Bougainville; Peabody Museum Papers, Vol. XXIX, No. 4, Cambridge.

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The Refractory Carbides

by
John T. Norton
Massachusetts Institute of Technology

The refractory carbides are characterized by such an unusual combination of properties that their use as the main component of special purpose alloys has a very promising future. The carbides are refractory in that their melting points are in excess of 2500°C and they have a very high hardness which is maintained even at elevated temperatures. On the other hand, considering their refractory nature, these substances have high electrical and thermal conductivities, with values comparable to those of the normal metals.

During the last 20 years, alloys in which the carbides form the principal constituent have had considerable practical application. Yet surprisingly little is known of their fundamental nature or the reasons for their behavior under the very circumstances which make them especially useful. Compared with our knowledge of many other useful industrial alloy systems, our lack of basic understanding of these carbides is striking. There is little doubt that a systematic attack on this problem will lead to valuable new information. Such data may further the development of better cutting and forming tools, or parts which are more resistant to wear and abrasion. Or it may lead to the production of structural alloys for high-temperature service which maintain their strength at elevated temperatures while successfully withstanding the effects of oxidation and corrosion. Moreover, it is possible that through this research some of the strategic elements now employed in alloys of this type may be replaced by others more readily available. Although much has been accomplished by an essentially empirical approach to some of these problems, the need now is for a fundamental understanding of the carbides themselves.

The refractory carbides are compounds of carbon with metals of the fourth, fifth and sixth groups of the periodic system of elements--the "transition" metals. Finely divided crystals of carbide, and a relatively small amount of auxiliary or binder metal, are combined by the techniques of powder metallurgy into strong, hard, dense bodies, known as cemented carbides.

Elements of the fourth group--titanium, zirconium, hafnium and thorium (Ti, Zr, Hf and Th), and the fifth group--vanadium, niobium, and tantalum (V, Nb, Ta)--form monocarbides of the MC type with a cubic structure analogous to sodium chloride. That is, the metal atoms are arranged in cubic close packing with the carbon atoms in the interstices (as shown in the model of Figure 1a). Tantalum, and the sixth group elements molybdenum (Mo) and wolfram (W) form carbides of the M_2C type, in which the metal atoms are arranged in hexagonal close

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John T. Norton received his B. S. and D. Sc. degrees from MIT where he is now Professor of Metallurgy. His special interests are physical metallurgy and X-ray metallography.

packing with carbon atoms in the interstices. Wolfram also forms a monocarbide, WC, but in this compound the metal atoms have the simple hexagonal arrangement shown in Figure 1b, rather than the cubic structures of the other MC type monocarbides. The analogous molybdenum monocarbide, MoC apparently does not exist, at least at ordinary temperatures.

In these different (but closely related) structures, the carbon atoms are in isolated positions, completely surrounded by metal atoms. There is probably strong metal-to-metal and metal-to-carbon bonding but very little tendency for the formation of carbon-to-carbon bonds. The factors determining these simple atomic arrangements seem to be essentially geometrical rather than chemical. Such structures are found only when the ratio of the sizes of the metal atoms to carbon atoms permits the latter to fit into the holes between the closely packed metal atoms. In the case of the chromium carbides, this ratio is unfavorable; consequently these compounds have a much more complex structure and a lower melting point than the others. This ratio, however, is not the only factor affecting the structure of the carbides for the valence of the metal appears to play a secondary role; this is probably the reason why wolfram monocarbide does not have the cubic structure of the fourth and fifth group monocarbides.

One interesting feature of the monocarbides is their ability to form substitutional solid solutions with one another in exactly the same way that metallic solid solutions are formed. If a mixture of two carbides is heated, diffusion takes place, and a single homogeneous phase is formed in which the ratio of metal atoms to carbon atoms is maintained at unity and the two kinds of metal atoms are distributed at random on the metal atom lattice (as shown in the model in Figure 2). In the case of the cubic carbides, the extent of solubility has been studied in detail by Norton and Mowry[1], and the results show that any two carbides are soluble in all proportions, provided that the sizes of the metal atoms do not differ by more than about 15 percent. In the case of the VC-ZrC pair, where the difference is about 20 percent, almost no solubility is observed. This is exactly analogous to ordinary metallic solid solutions where the 15 percent limitation applies; it means that if the stranger atom is either too large or too small, the resulting localized distortion cannot be tolerated by the lattice. Under these circumstances the mixture is more stable than the solution. Thus far, at least, no tendency for ordering or a regular distribution of the two kinds of metal atoms in the carbide solid solution has been observed. On the contrary, if the size difference approaches the 15 percent limit, the solution is continuous at high temperatures but a solubility gap appears at lower temperatures and the homogeneous alloy "unmixes" into two solid solution phases. It has also been observed that the ternary and quarternary solid solutions form readily.

Study of the solubility of the hexagonal WC with the cubic carbides has shown that while the cubic carbides will dissolve considerable WC, the converse is not true--that is, WC will not tolerate an appreciable number of stranger atoms in its lattice. The solubility limit of the

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[1]Norton and Mowry: Journ. Metals, A. I. M. E., Metals Trans. 185, 133, 1949

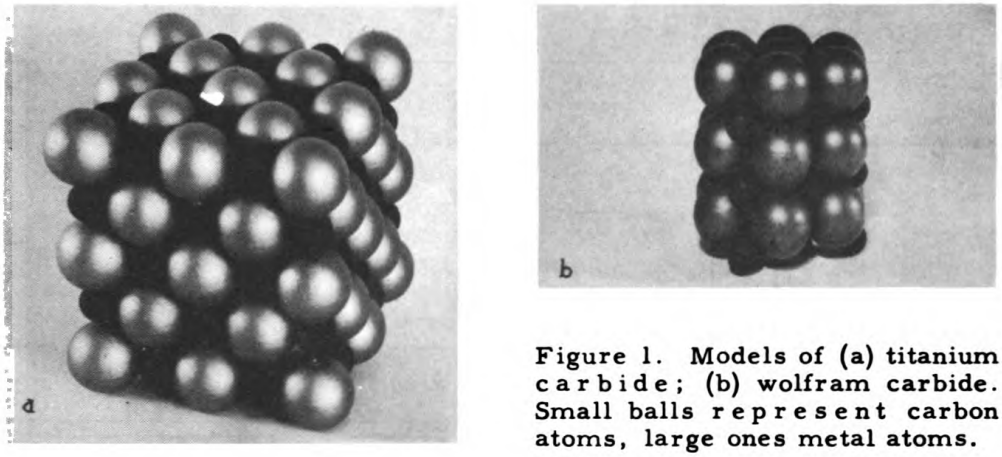

Figure 1. Models of (a) titanium carbide; (b) wolfram carbide. Small balls represent carbon atoms, large ones metal atoms.

cubic solution increases rapidly with increasing temperature, but so far there seems to be no simple relation connecting the magnitude of the solubility with relative atom size.

In spite of the wide commercial use of cemented carbides there has been no systematic investigation of the physical properties of the solid solutions involved. It seems reasonable to suppose that the desirable properties of the cemented carbides themselves could be considerably improved by the proper choice of appropriate solid solutions of two or more carbides, provided the general dependence of properties on composition were known. Yet there is no reliable data on even such a simply measured property as relative hardness. One reason for this, of course, is the difficulty of making suitable measurements on powders, and the lack of methods for converting the powders into solid dense bodies without an auxiliary binder metal. Recently, considerable progress has been made in the latter direction and preliminary work is underway in studying the solid solutions.

Studies made on the behavior of the electrical and thermal properties of the solid solutions offer an example of this progress. As has been pointed out, the pure carbides, in spite of their high melting points and hardness are rather good conductors of heat and electricity. In Table I these properties of the carbides, measured on solid blocks, are compared with the values for the metals themselves, as reported in the literature. Another study made was an exploratory investigation of two continuous solid solution series, TiC-ZrC and TaC-NbC. Although the data is incomplete, it is clear that in these two series the electrical resistivity and thermal conductivity follow an

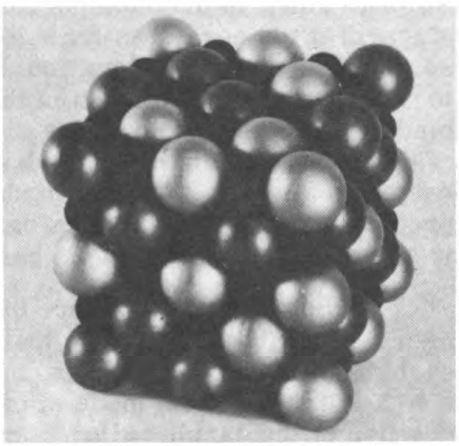

Figure 2. Model of solid solution of wolfram carbide in titanium carbide. Large light balls represent titanium atoms, large dark ones wolfram atoms; small balls are carbon. Note random distribution of large balls.

TABLE I. Comparison of Electrical and Thermal Properties of Metals and Carbides

Substance	Electrical resistivity (microhm cm)	Thermal conductivity ($cal/cm^2/°C/sec$)
Ti	48	0.036
TiC	105	0.041
Zr	39	0.041*
ZrC	75	0.049
Nb	14.2	0.112*
NbC	74	0.034
Ta	15.5	0.103*
TaC	30	0.053

*Calculated from electrical resistivity on basis of a normal Wiedemann-Franz ratio of 160×10^{-4}.

essentially linear relationship as a function of composition. This is contrary to the behavior of metallic solid solutions, for in these, the curves show pronounced maxima or minima at the mid-composition ranges.

The temperature coefficient of electrical resistivity and the thermoelectric power of the two series mentioned above was also measured as a function of composition and again the curves were essentially linear. Thus, although the general magnitude of the properties suggests that the carbide solid solutions behave like normal metals, the variation in properties with composition suggest that, on the contrary, they are fundamentally different from the normal metals.

The mechanical properties of the carbide solid solutions have not yet been studied, but this work is in prospect. One difficulty is the preparation of specimens which will be sufficiently dense and homogeneous so that the true properties of the solid solution can be observed.

At present, useful carbide parts are made of cemented carbides and the problem of the cement or binder is of the greatest importance. For one thing, in high-temperature applications, the parts begin to lose strength at temperatures far below that at which the carbides or carbide solid solutions themselves would be affected. This loss is due either to solution of the carbides in the binder, or to incipient melting of the binder phase. Our knowledge of the true role of the binder phase and of the basic mechanism of the densification process is still fragmentary but it is felt that a better binder phase is possible. Moreover, the preparation of strong, dense carbide alloys without auxiliary binders is a problem which should be carefully investigated.

Studies on the resistance of carbide solid solutions to oxidation at high temperatures[2] indicate that these substances are superior to pure carbides. Since individual carbides vary considerably in this respect a detailed study of the mode of oxidation and its dependence on the composition of the carbide alloy seems to be desirable.

An examination of our present knowledge of the refractory carbides emphasized the tremendous amount of information which is needed if a really intelligent use is to be made of their unusual combinations of properties. Careful and systematic research of a fundamental nature on these unique substances should eventually yield substantial dividends.

[2] Redmond and Smith: Journ. Metals 1, 987, 1949.

Trukese Privacy Patterns

by
Ann Fischer
Radcliffe College

The following two articles continue the series started in the June 1950 issue (see pp. 1-12) describing Scientific Investigation of Micronesia (SIM). This program, supported by ONR and staffed and supervised by the Pacific Science Board, involves an extensive investigation of many phases of life in the United States Trust Territory of the Pacific.

The purposes of the SIM program have been many. In general, they are to increase the existing knowledge of the Trust Territory, to make administration both easier and more rewarding to the United States and to the citizens of the Territory, and to advance the scientific knowledge of a part of the world which was almost inaccessible during the years of Japanese reign. Anthropologists, on their part, have considered this an excellent opportunity to study the rapidly shrinking, so-called "primitive" parts of the world. These areas serve social science in about as nearly a "human laboratory" capacity as is available anywhere.

As a member of the female sex, I felt that my own project would be most valuable if it dealt with material most accessible and most interesting to women. My project was titled "The Role of the Trukese Mother, and the Effects of this Role on the Child Training."

In this article I have attempted to abstract from the material gathered in the preparation of the project, facts which might be of general interest to readers, and which would at the same time give a glimpse into anthropological field work. I have selected a pattern of behavior which contrasts strikingly with American custom and will attempt to explain how this different type of behavior becomes a part of Trukese habit.

Both American scientists, who have lived among the Trukese, and Navy personnel, who have employed Trukese to work for them in a domestic capacity, have been struck by the vast difference in the extent to which the individual Trukese takes responsibility for sharing material goods with more distant relatives and the extent to which an American in a similar position would take like responsibility. An average American, living in a Trukese community, quickly finds himself longing to be alone and unable to achieve this state of affairs. We may call these patterns of behavior which deal with personal property and with the ex-

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Ann Fischer is at present an anthropological field worker in Truk, Trust Territory, under a grant from the Pacific Science Board of the National Research Council under ONR contract. Mrs. Fischer received her A.B. from the University of Kansas in 1941, and is a graduate student at Radcliffe College, Cambridge, Mass. The area of Micronesia which she discusses in this article is located in the Caroline Islands, about 800 miles north of Rabaul, New Britain.

tent to which a person lives in a group rather than alone, patterns of privacy.

A good Trukese is supposed to be willing and ready to give up most of his personal possessions to a large number of relatives if he is requested to do so. Those who are most likely to make such a request are his in-laws and these he is in no position to refuse if he wishes to maintain his marital status. Goodenough, an anthropologist who studied on Truk, found this to be true of men, living among their wives' people.[1] Other evidence indicates that any set of in-laws who happen to have an advantage over either a male or female marriage partner, due to the fact that the person concerned is especially interested in continuing the marriage because of emotional ties or material benefits, is likely to make what Americans would consider unreasonable demands on that person. Thus, a woman from a distant part of Micronesia, Palau, is constantly requested to give up clothing to in-laws who have considerable advantage over her because she has neither the money to return to Palau, nor the desire to leave her husband and child to do so. To the Trukese, it is a mark of regard for one's spouse if one conforms to the requests of in-laws.

Within the more immediate Trukese family, property is more often simply shared rather than given. The sharing of property such as clothing may extend to friends as well as to members of the family, and accounts for the fact that on successive days different women may be seen wearing the same dress. In this process, Americans might become confused as to actual ownership, but the Trukese manage to keep in mind to whom the dress actually belongs, and it will eventually be returned to its owner, perhaps somewhat the worse for the wear. This type of generosity appears more remarkable from the American point of view when it is also known that clothing is difficult to acquire and highly prized in Truk.

However, in one area, it is possible for a person to refuse a request for something without extensive censure, and in some cases he will even be praised. One of these cases would be an attempt to take a child by adoption from its parents. Here, if the emotions reign, and the child is retained by its parents, the remark may be made that "the parents loved the child too much to give it to anyone". This is commendable, but if the child is given away it is also considered commendable--the parents love the person to whom it is given. A child is usually given for adoption only to a very close relative. It is then remarked: "The parents loved the child so much that they were only able to give it to a close relative."

With regard to food, it is almost impossible to withhold a requested item from the would-be taker without being considered extremely ungenerous. Since food is a necessity, and since many Trukese are not especially enamored of doing the work it takes to get it, a request may be dodged in the case of non-relatives by saying that there is no food. As this is a particularly touchy subject with the Trukese, there are

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[1] Goodenough, W.H., Property, Kin, and Community: The Social Organization of Truk, a typewritten report to the Pacific Science Board, on field work done in 1947.

Figure 1. Trukese consider a group of three or more persons a sufficient protection against "ghosts".

many rules against asking for food and many rules as to from whom, by whom, when, and how food may be requested. Domestics, living in American homes, may consider themselves obligated to acquire as much food from this source as possible and to pass as much as possible on to relatives. At the same time a Truk may consider himself to be somewhat of a relative in the American household. This leads to a great deal of concern on the part of the American housewives, and the Trukese who has learned that Americans do not like this attitude and has abandoned it is the most sought-after servant.

Thus, we see, that private property, which in many American cases would be used exclusively by one person for the duration of its usefulness, rarely exists among the Trukese. Although the lines of privacy in regard to personal property may be less finely drawn among the lower classes in America, they probably never reach the Trukese extreme.

In the same way, where, in America most people have the opportunity to be alone, if only with their thoughts in a crowded subway, in Truk, aloneness comes rarely, perhaps only in dreams. For every venture, a companion must be found. "I cannot go because there are none of my friends (to accompany me)," is a statement often heard, or the question "Who will accompany her?", or the command, "So-and-so will accompany her."

In Trukese society one lives, usually in a one-room house, which is also occupied by parents, unmarried brothers and sisters, and perhaps some married brothers and sisters with their spouses. Other relatives or friends may also live with the family. Sleeping arrange-

ments are such that there may be a large number of persons or couples under one mosquito net, although additional mosquito nets, a porch, or a nearby thatched cookhouse may serve to separate relatives for whom it is improper to be in too close contact. Therefore, one is rarely at a loss for a companion. If a Trukese awakens in the night, he will immediately punch a sleeping friend or relative to join him in his wakefulness. Waking a sleeping Trukese is no easy matter, and a name, though not called loudly, may be called over and over to accomplish the desired end. In the process, it is remarkable that more of the neighboring sleepers do not awaken. If they do, they join in the conversation and in calling the sleeper. Those who are awakened never appear angry, grouchy, or drowsy as a result. In fact, to an American, a Trukese household seems especially animated in the early morning hours when the family is just getting up. To one who wants to sleep, the most conversation, shouting, and general expression of good spirits seems to occur at this time. One informant stated that he remembered being slightly unhappy on a few occasions when awakened at an untimely hour but this feeling passed very quickly. He also stated that if he wakes up when others are sleeping, he feels happy, and wants others to wake up and share his good spirits with him. The capacity to sleep soundly with considerable surrounding noise makes it possible for Trukese to make up missed sleep during daytime hours.

An American in Trukese society, trying to accomplish work which requires a certain amount of solitude, has a great deal of difficulty. Repeated attempts to seclude oneself can only result in the Trukese feeling that the person sent to "keep one company" is unsatisfactory for that purpose and someone else must be dispatched at once to fulfill this duty. On one occasion when the adults in the family were busy with their own affairs, the children were sent in order from youngest to oldest and an explanation had to be made to each one in turn that the worker desired to be alone. A wish to be alone is unthinkable to a Trukese. The more people, the better; the bigger the family, the better; no one will have to work or be alone, and shared tasks are infinitely lighter. One person is bad, two people are not good, but adequate, and any undertaking is much more desirable if at least three people are included in the plans.

A Trukese, who had been hired as a part-time language teacher, found his morning work completed, his stomach empty, and a desire to get home to eat. In this he was completely frustrated, as, on looking about, he saw no one who could take his place as companion to the anthropologist. When an inquiry was made as to why he had not gone, he gave his reason and was assured that being alone was not a thing which the anthropologist considered undesirable. As this man had worked for Americans before, he had given this matter some thought. He stated that he had learned that this was the case with Americans and had further come to the conclusion that this difference from Trukese was due to the fact that Americans always seemed to have something to think about, whereas Trukese, who have nothing in particular on their minds, just want to visit all the time. Aside from the obvious attempt to flatter Americans, which is also a Trukese habit, this certainly coincides with the observation that Trukese do not tend to be arm-chair philosophers.

Although there are some subjects which are considered inappropriate between certain people, most Trukese conversations are not of a

Figure 2. Trukese are usually found in large groups like this one.

private nature and need to be altered little, except perhaps along courtesy lines, to include another individual. When subjects are under discussion which would be tabooed if certain people entered the conversation, there seems to be little feeling of intrusion if the tabooed person arrives and the conversation has to be changed.

Although an individual is unlikely to demand much privacy, certain groups are expected to maintain it at certain times. There are definite feelings against approaching a place where members of another family are eating. This would put one in the embarrassing position of appearing to request food. It is also desirable for children to remain largely within the family group in their play activities. Although this is considered desirable, it is seldom practiced by the children. Lines are always more strictly drawn where members of other families are concerned. In cases of close friends, kinship terms are applied to the friends to assist in making more intimate behavior appropriate.

From the aforegoing, it is evident that in the Trukese community to an even greater extent than in the American small town, one's property, and certainly one's life, are not one's own. The question arises as to why this should be the case. The lack of material goods and the close living arrangements can be taken as only a partial explanation. Inquiry into the education of the Turkese child is necessary to understand this lack, and even fear of privacy.

Before considering the educational process, it should be stated that Trukese society is a cooperative one as opposed to the individualistic culture of America. The unit of cooperation in Truk is the extended family. In order to achieve and maintain cooperation, every child in the community must grow up learning that the welfare of the group is as important, and perhaps more important than his individual welfare and the satisfaction of his individual desires. If it is impossible for an egocentric human being to learn this lesson, then he must be taught, or forced, to act as though he has learned it. The essence of cooperation is contact. In Truk, it is perhaps this fear of the loss of contact that is taught to every child, which keeps the strong working and cooperating with the weaker members of the society.

From the time the child is born, he is held almost constantly. Generally the mother carries the child about, but it may also be the father, brothers and sisters, grandparents, or aunts and uncles. (These terms, of course, are not equivalent to Trukese kinship terms.) Unlike some primitive peoples, the Trukese have fashioned no devices (which interfere with human contact) to help them care for their babies. There are no cradles, carts, or other contrivances, to assist in transporting the children. The only device observed in use in carrying children is a towel, sheet, or strip of cloth, sometimes tied under the child's buttocks and around the mother when a considerable distance is to be traversed on foot. A large number of carrying positions have been developed, the chief of which is with the child astraddle the mother's back, the mother's hands supporting the child's buttocks, and the child clinging to the mother's clothing for additional support. Even very young children are able to assist in staying in this position. Trukese are adept at getting the children on and off their backs without mishap. After a few months of this kind of treatment the child shows signs of discomfort when out of contact with the familiar carrier. At the slightest additional frustration in his activities he will begin to cry loudly and cling to his mother until he is taken up.

Trukese mothers are left in a position, as far as their duties go, to give this constant attention to the child. Other members of the family are supposed to provide, as far as they are able, for the needs of the mother and child. Food is brought to them. If people are available, such bits of work as washing clothes, which would take the mother away from home, are done for her. The duties of the mother consist of staying in the house and caring for her children. The only thing which interferes and distracts her from this task are the constant conversations which go on with other members of the family or passing friends.

If the Trukese mother grows tired of caring for the child, there are generally many willing hands which are eager to have a share in holding and playing with the baby. Whoever may be in charge of a child at a given time is no casual baby-sitter who is eager to get the baby off to sleep so that school work may be done. On the contrary, it is a person who has voluntarily taken up the baby and enjoys playing with him. The large extended family makes the baby-sitting problem simple.

Just as children "get used" to playing alone in play pens in America, in Truk they "get used" to being in contact with others. As adults, this is carried over into a type of behavior seldom, if ever, seen in America.

Adults of the same sex will be seen walking along holding hands or lying down with head upon the lap of another. This activity does not appear to be connected with overt homosexuality, although many observers have looked for it.

In addition to being held constantly as young children, young Trukese are further trained to desire the company of others by being frightened into believing that they will be eaten if they venture off alone. All strange things, animate or inanimate, are said by the mother to be things that will "eat" the baby. Uninhabited areas are said to be the homes of spirits who will eat people. Such places may be visited only in the company of others. These spirits are called soope, and are thought of as ghosts of the dead. When a person is alone he is most susceptible to their attack, although these soope have also been known to eat two people who are together. There is little danger from this source, however, if there are more than two persons present. The soope are angered and more prone to eat a person if he has not performed his duties toward some close relative of the dead spirit.

The parent, who tells the child not to touch something because it is a ghost and will eat the child, knows that he is using this as a device to impose his wishes on the youngster. But the boundary of reality becomes hazy to the adult also, where the spirits of the dead are concerned. He knows that the various foreigners who have governed him feel that these beliefs are false, and he will sometimes give lip-service to their falsity himself; but he still behaves as though the ghosts were there, and practices the magic necessary to protect himself from them.

Privacy patterns in Truk are thus, in part, integrated into the behavior of the Trukese by the development in the child of a need for close human contact and a fear of the supernatural forces which threaten a single individual. This development is made necessary both by material circumstances and by the type of cooperative society which exists in this part of Micronesia.

* * *

Ponape's "National" Beverage

by
Sidney F. Glassman
University of Oklahoma

Figure 1. Sakau
(Piper methysticum)

Everybody knows that an Englishman likes his "spot of tea", while the average American prefers a cup of coffee, and the German a stein of beer. This widespread custom of a "national" beverage appears to extend even to some natives of mid-Pacific shores. Recent studies made on Ponape, a small island in Micronesia, indicate that the popular drink there is "kava" or "sakau", which is prepared from a local plant.

Other drinks are, of course, made on the island. Alcoholic beverages (though their use is limited) are well known. Fermented drinks--popular only in a few localities--include "rah-matal" and "rah-mangar", both prepared from coconut blossoms. Although natives know how to make several varieties of whiskey, distillation of these has become illegal since the American occupation of the island. Among those familar to the natives are "Sakau-looie", prepared from sugar cane, coconut or tapioca, and "sakau-n-wai", a banana product. Other island plants are utilized to make nonalcoholic drinks;"matieu", for instance, is a beverage prepared by boiling the bark of a native species of cinnamon found in the mountains of the island.

"Kava", however, is much more widely used. From a social and religious standpoint it is undoubtedly the most important drink on Ponape, for it is employed by the islanders not only as a beverage but also as a soporific, a medicine, and even as a ceremonial draught at some of their feasts.

Kava is prepared from the Piper methysticum plant (Figure 1), a shrub known to the natives as "sakau" or "shakau". There is no definite information on its origin or the date of its introduction into Ponape, but it probably came from either Melanesia or Polynesia at some early date. A member of the Piperacae family, it normally attains a height of from six to ten feet, with a trunk diameter of one to one and one-half inches. Its leaves are heart-shaped, its inflorescence spike-like. Natives claim that in some localities this plant has reached a height of 50 feet with a trunk diameter of one to three feet.

Sidney F. Glassman received his B.A. and M.A. Degrees in Botany from the University of Illinois, and he is now a Graduate Assistant in the Department of Plant Sciences at the University of Oklahoma. In 1949, he was sent to Ponape for the purpose of studying the flora of that island, as part of SIM.

Figure 2
Preparing Kava on Ponape

ⓐ The roots are ground--

ⓑ The pulp kneaded--

ⓒ And spread on bark--

ⓓ From which kava is wrung

In the ordinary preparation of sakau (Figure 2), the entire shrub is uprooted, the roots chopped off, and loose soil removed from them. Then they are placed, unwashed, on a large, flat basalt slab which rests on several coconut shell halves. Rocks are used to pound the roots into small pieces (2a) and, as the pounding continues, small quantities of water are added. From time to time the pulp is kneaded by hand (2b) in order to test its consistency. When this is suitable, the mass is placed on wet strips of "kalau" (Hibiscus tiliaceus) bark (2c), which are then wound around the pulp. Finally the liquid is wrung out of the pulp into a coconut shell (2d) and, in the ordinary course of events, is drunk immediately (Figure 3). Because of the mucilage which comes from the kalau bark, kava has a slimey consistency and when it is first swallowed it gives a numbing sensation to the mouth. Some

Figure 3. Kava is usually drunk immediately after preparation.

people think it tastes very much like soap-suds!

If taken in excess, kava has the effect of a soporific, inducing a pleasant, undisturbed sleep. The chemical principle responsible for the chief physiological action of this drink is a resin, which first has a stimulating, then a depressing effect on the system. Kava has been used medicinally for chronic irritations of the genito-urinary tract, especially gonorrhoea. In fact on Ponape, the drink actually is considered to be a panacea for all ills, while on other islands it has been used as a remedy for bronchitis, skin ulcers and yaws.

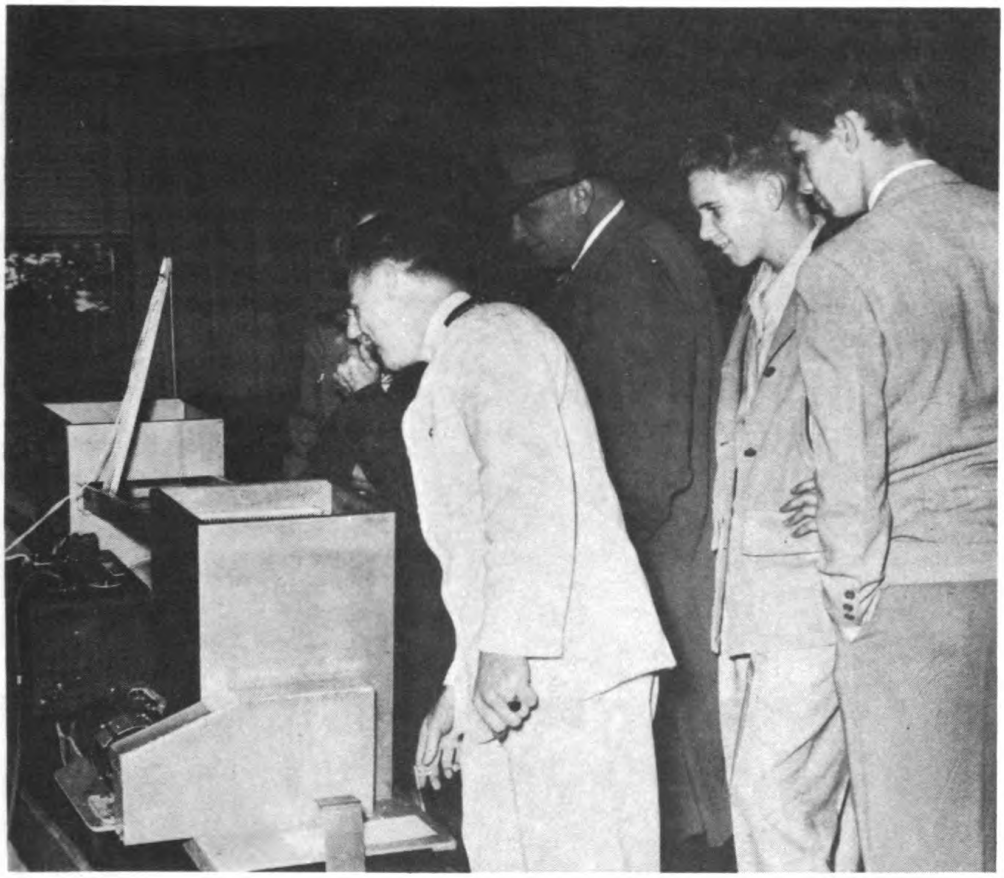
On Ponape, during ceremonies or feasts attended by native chiefs or foreign guests, the preparation of sakau varies a little from the ordinary method. In a ceremony witnessed by the writer at Auak, a number of stone slabs were used for pounding the roots. As the men pounded in unison, a few women arose and danced to the rhythmical sounds emitted from the slabs. After the drink was prepared, each participant offered his filled cup to a chief or guest, turning away his head as he did so. This traditional gesture dates back to ancient times when natives without rank were forbidden to look at kings or chiefs.

The actual origin of kava drinking is not known, but it is likely that it started, not in Micronesia, but in the Papuan region of New Guinea, where the custom reached its highest development. In fact the drink is known on many islands outside of Micronesia. In Polynesia, for instance, Piper methysticum has been variously called "kava", "kawa", "ava" "awa" and "hoi", while in Fiji it is known as "yakona" or "yangona". The drink is also used in Hawaii, Samoa, Tahiti, Tonga, Cook Islands, Tuamatous, and the Austral Islands. In Micronesia it was known as early as 1828 on the Island of Kusaie, 300 miles southeast of Ponape, but the drink was banned there by missionaries in 1850; at present Ponape is the only Micronesian Island where kava is prepared for daily use.

On Ponape, too, various restrictions have been connected with the preparation and drinking of kava. Before contact with white men, it could be made only by noblemen. During the German period (1899-1914), this restriction was removed, and since that time anyone may concoct the drink. During the war, the Japanese limited kava drinking to once a week, and to authorized ceremonial occasions-a restriction enforced because indulgence made the natives lazy, and because it was believed that the drink had certain toxic effects on the body. At present, the United States Government has not attempted to interfere with the tradition of kava preparation, nor has it placed any restrictions on its use. Thus, for Ponape, kava still retains its place as the rough equivalent of a "national" beverage.

On the Naval Research Reserve

VRRU W-2 Host at NRL on Armed Forces Day



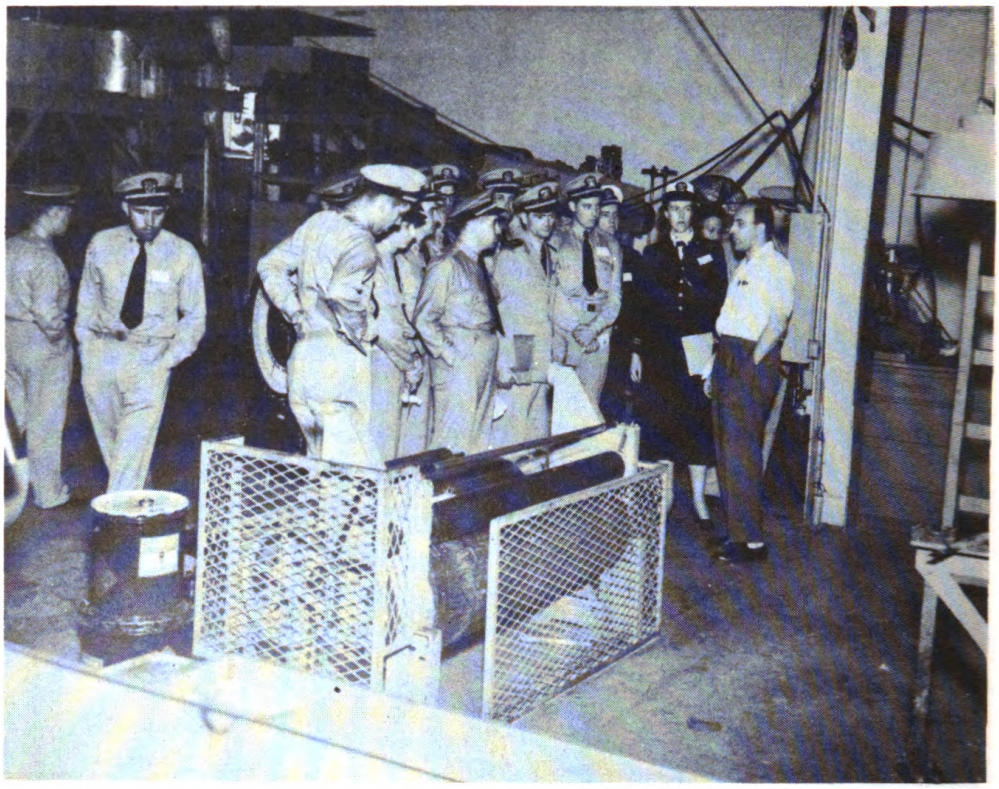
Armed Forces Day was the occasion for open house in the Exhibit Room at the Naval Research Laboratory, Washington, D. C. On deck to welcome guests and to explain the Laboratory and its work were the members of NRL's VRR Unit W-2, LCDR Howard A. Tanner, Commanding Officer.

The building which was open to the public was appropriately festooned with colorful Navy signal flags. Outside the buildings a special display of Naval firefighting equipment was set up, manned by representatives of the Laboratory's fire department.

VRRU 3-2 Host at Special Devices Center

VRRU 3-2, CDR L. E. Yoder, USNR, Commanding Officer, at Sands Point, Long Island, was host at the Special Devices Center on Armed Forces Day, 20 May. The unit "took over" the Center for the day as the result of an invitation extended by Capt. J. R. Ruhsenberger, USN, Commanding Officer of Special Devices. One point of credit of appropriate duty was granted for time served as a guide or demonstrator in showing visitors the center.

Reserves at Naval Ordnance Laboratory



Groups like these visited many naval laboratories

Third Annual VNRR Seminar Held

The third annual Naval Research Reserve Seminar in Washington was opened officially by Rear Admiral T. A. Solberg, USN, Chief of Naval Research, on 7 June. One hundred specially qualified Reserve officers, nearly all of whom were members of the 84 Volunteer Research Reserve units throughout the country, assembled to hear his speech of welcome.

After extending greetings, Admiral Solberg introduced the Honorable Dan A. Kimball, Under Secretary of the Navy, who spoke on "The Potential Value of the Research Reserve". Describing the need for more trained men in basic scientific research today, he emphasized the importance of the Research Reserve as a source from which could be drawn officers with essential research orientation.

Rear Admiral R. S. Riggs, USN, Assistant Chief of Naval Operations (Naval Reserve Division), also addressed the first assembly meeting of the entire group. Speaking on "Naval Reserve Plans" he outlined the program for the immediate future and discussed long-range planning in broad terms.

Other speakers the first day were CAPT J. B. Pearson, Jr., USN, Deputy and Assistant Chief, ONR, whose subject was "ONR and the research Reserve" and Dr. A. T. Waterman, Deputy and Chief Scientist, ONR, who talked on "ONR and the National Science Foundation".

Closing the first day's program, CDR Albert Cook, USNR, Director, Naval Research Reserve, described the "Seminar Schedules and Agenda".

Other speakers during the two-weeks' training period included Mr. Wilfred V. Rutledge, who is the Director of the Maintenance Division, Special Devices Center, Sands Point, Port Washington, L. I., who opened a general seminar on special devices with a talk on "The Special Devices Program"; Rear Admiral H. A. Houser, USN, Head, Legislative Branch, Department of Defense, whose subject was "Legislative Proposals Affecting Naval Reserve"; CAPT J. H. Shultz, USN, Assistant Chief for Naval Reserve, Bureau of Naval Personnel, who discussed "The Volunteer Reserve Program"; CAPT C. G. Pendill, USNR, Navy Secretary Civilian Components Policy Board, who spoke on "The Civilian Components Policy Board Proposals Affecting Naval Reserve"; and Rear Admiral F. S. Withington, USN, Director, Atomic Energy Division, CNO, whose subject was "Some Aspects of the Navy's Interest in Atomic Energy"

The Bio Sciences, ONR, were represented by Dr. Orr Reynolds, Director Biological Sciences Division; and Dr. Roger D. Reid, Head, Microbiology Branch. Representing the Human Resources Division were Dr. Ralph Hogan, Head, Manpower Branch; and Dr. John T. Wilson, Head, Personnel and Training Branch.

"The Research Program of ONR" was described by CAPT W. H. Leahy, USN, Assistant Chief for Research, followed by Dr. E. R. Piore, Deputy for Natural Sciences, and several members of his staff. CAPT

J. A. Jordan, USN, Deputy for Naval Sciences, and Lt. Col. C. R. Schwenke, USMC, Head, Amphibious Branch, discussed ONR research from their specific viewpoints.

Special emphasis was given to the subject of public relations and information. In this connection CAPT Harry E. Sears, USN, Director of Public Relations, spoke on "The Naval Reservist's Role Navy Public Relations"; CDR F. J. Loveless, USNR, talked about "The Research Reserve Unit and Public Relations", and Mr. Kenneth Laurie, Acting Head, Navy Research Section, Library of Congress described the "Availability of Technical Information to Research Reserve Units."

An opportunity to see at first hand how the Navy conducts research in the medical field was given in a general one-day seminar at the Naval Medical Research Institute, Bethesda. Another day a similar general seminar on the physical sciences was held at Naval Research Laboratory. The Naval Ordnance Laboratory and the Applied Physics Laboratory, Johns Hopkins University, both under the cognizance of the Bureau of Ordnance, were toured on different days. An entire day was spent at the Engineering Experiment Station and U. S. Naval Academy, Annapolis, Md. Each tour was expertly organized and smoothly conducted.

In order to acquaint the Research Reservists with similar training programs in other branches of the service, "The Army Research Reserve Program" was described by Col. John A. Andrews, Infantry Reserve Commanding Officer, 2901st Research and Development Training Group, Veterans Administration, and "The Air Force Research Reserve Program" was the subject of a talk by Col. Bruce B. Price, USAF, Assistant Chief for Special Weapons.

Most of the talks during the two-week period ended with question periods. The type of questions asked, as well as the number, were evidence of the interest shown by the Research Reservists in the Seminar Training Program. The Navy believes the country can count on these men for leadership in science.

* * *

CAPT JOSEPH W. HAMMOND, USNR, Commanding Officer of VRR Unit 1-1, Boston, died 19 April 1950 in a canoeing accident at North Adams, Mass.

After completing his work toward the master's degree at MIT, CAPT Hammond served as a second lieutenant in the Army from June 1927 to June 1933. He entered the Naval Reserve as a lieutenant in September 1937 and went on active duty with the Navy in August 1940 as instructor of electrical engineering at Annapolis. Later he served at the Philadelphia Navy Yard and as executive officer of the Naval Technical Mission to Japan. A skilled engineer, he supervised design and construction of the supersonic wind tunnel at MIT.

CAPT Hammond wore the American Defense ribbon, the American Area ribbon, Pacific ribbon, and World War II Victory ribbon.

VRR Seminars Approved For Fiscal 1951

The Chief of Naval Personnel has approved the following seminars for Volunteer Research Reserve personnel during fiscal year 1951:

Location	Probable Date	Total Quota
ONR, Washington, D. C.	Sept. 1950	100
ONR, Los Angeles, Calif.	Nov. 1950	50
SDC, Long Island, N. Y.	July 1951	60
Oak Ridge Nat'l Lab., Oak Ridge, Tenn.	Mar. 1951	50
Camp Detrick, Md.	Aug. 1950	50
NRL	Aug. & Oct. 1950 Jan. & Apr. 1951	200
	Total	510

In addition, 90 miscellaneous billets have been approved for Volunteer Research Reserve officers in "on-the-job" training.

CDR Cook Visits VRRU 9-15

CDR A. B. Cook, Director of the NRR spoke on the objectives of the Research Reserve program and its administration, at a recent meeting of VRRU 9-15 at Midland, Mich. CDR R. W. Mayhew, Reserve Program Officer for the 8th and 9th Naval Districts and LTJG D. D. McCollister, Commanding Officer of the Unit, also participated in the discussion. The unit, which is composed mainly of research scientists, had 100 percent attendance at the meeting.

VRRU 5-5 Activated in Richmond

Volunteer Naval Research Reserve Unit 5-5 was activated 17 May in a brief ceremony at the Medical College of Virginia. One of about 85 such units connected with major research and educational facilities throughout the country, the unit has assigned to it Naval Reserve officers in the Richmond area who are engaged professionally in research in a branch of science of interest to the Office of Naval Research.

Taking part in the activation ceremony last night were CAPT O. L. Livdahl, Director of Naval Reserve, Fifth Naval District, Norfolk, and CDR A. B. Cook, Director of Research Reserve, Washington. Present as guests were CDR P. Crouch, officer in charge, Navy Recruiting Office, Richmond, and CDR R. B. Keeley, President, Officers Club of Virginia; LCDR H. E. Hollingsworth, inspector instructor, Naval Reserve Training Center, and LCDR J. F. Maher, commanding officer of Organized Surface Battalion 5-5, Richmond; Dr. W. T. Sanger, president, Medical College of Virginia and Major General W. F. Tompkins, Comptroller, Medical College of Virginia.

CAPT R. D. Hughes, professor of biology at MCV is commanding officer of the new unit. Other officers in the unit are CDRS C. M. Nelson, J. H. Weatherby and G. Z. Williams; LCDR C. M. Preston; LTS L. D. Abbott, Jr., E. S. Harlow, P. M. Pedersen, D. A. Rosebery and W. B. Wartman, Jr.; LTJGS W. S. Benica and L. A. Purdy, and Captain W. T. Ham, Jr. (USMCR).

The purpose of the Volunteer Naval Reserve Program of the Office of Naval Research is to provide an adequate, trained force of Naval Reserve personnel who will be available for mobilization in the event of an emergency for assignment to activities under the management control of the Office of Naval Research.

Dr. Thomas J. Killian, Science Director and Deputy Assistant Chief for Research, Office of Naval Research, was recently appointed to one of the 17 top (GS-17) government positions created by Congress. Before coming to ONR in 1946 Dr. Killian had held positions of note in academic fields, industry, and as a commander in the Navy during World War II. He was graduated from MIT in 1926 with an M.S. in Electrical Engineering, and from Princeton in 1929 with a PH.D. in Physics. He was instructor of physics and electrical engineering at MIT, Dean of Mathematics at Seattle College, research assistant to Dr. I. Langmuir at the General Electric research laboratory, and Vice President and Director of Research of the Barkon-Frink Tube Lighting Corp. Dr. Killian was called to active duty in the Naval Reserve in 1941. Among his important assignments were - head of the Physics Section at the U.S. Naval Postgraduate School, Project Cadillac Coordinator for CNO, and Electronic Guided Missile Coordinator for CNO.

The Volunteer Naval Research Reserve

by
T. J. Killian
Office of Naval Research

The following talk was given to the Naval Research Advisory Committee earlier this year. Dr. Killian is a Commander in the Naval Reserve and Training Officer for the W-1 Battalion.

The Volunteer Naval Research Reserve is the newest but by no means the least important activity of the Office of Naval Research. Like ancient Gaul, ONR may be considered to be divided in three parts. One of these consists of the laboratories under the control and administration of ONR. These are the Naval Research Laboratory at Anacostia, the Special Devices Center at Sands Point, Long Island, and the Underwater Sound Reference Laboratory at Orlando, Florida. The second major part is the University Research Program under the technical direction of the Research Divisions. The Naval Volunteer Research Reserve is the third major component of ONR.

It is interesting to compare the number of technical or scientific people in these three groups. The laboratory group contains about 1200 technical or scientific personnel. Nearly 3000 scientists and 2500 graduate students are actively engaged in the University Program. Eighty-five Volunteer Research Reserve Units have been activated to date. These units comprise approximately 3000 officers of whom 75 percent are technically or scientifically trained. The units in general are in universities or other research centers. They consist of inactive reserve officers who wish to maintain an active interest in the scientific activities of the Navy. To date the activities have largely been concerned with the organization of the units, and the familiarization and indoctrination of the members with ONR and the post-war Naval Reserve. Most of the units meet twice a month. In addition to being exposed to the usual official memoranda and notices, there is usually an invited speaker addressing the unit on some scientific or technical subject. From time to time motion pictures have been shown and trips or tours have been arranged. This type of peacetime activity may be sufficient during the formative periods but it will not be effective in maintaining the interest of the best members of the Research Reserve. Even now there is a great deal of dissatisfaction among the members of the Research Reserve over the possibility of unit activities being limited to this type of program. It is the responsibility of ONR to formulate a training program which will attract and hold the intellectual interests of the best members of the units.

Before considering the type of training program, it is first necessary to examine some of the possible purposes and objectives of such a peacetime training program. There are many purposes which a training program might support in full or in part. Let me mention a few.

(1) To furnish points for retirement purposes. For retirement purposes each 360 points a reserve officer accumulates is the equiva-

lent of a year of active duty. However, in order that these points may count, it is necessary for a reserve officer to accumulate not less than 50 a year. Furthermore, no more than 60 points accumulated outside of active or training duty can count for retirement purposes in any one year. Under present regulations, a reserve officer automatically receives 15 points per year. Each drill he attends counts as one point. Additional points may also be obtained by the successful completion of correspondence courses or by other approved appropriate or equivalent training duty. Since funds for training duty are severely limited for the Volunteer Reserve, much serious consideration must be given to approved appropriate duty.

(2) To furnish points for promotion. The policy with respect to points required for consideration of promotion has not been clearly defined. However, a minimum number is now being considered by the Bureau of Naval Personnel.

(3) To keep the Research Reserve officer informed with regard to the activities of ONR.

(4) To build a strong public relations group for ONR and the Navy.

(5) To provide an extensive education in general scientific matters.

(6) To provide a military scientific society.

(7) To provide a channel for the flow of ideas and suggestions from members of the Research Reserve to the Navy and the Department of Defense.

(8) To provide a variety of peacetime activities which will be equally useful to both the Department of Defense and the individual Research Reserve officer.

(9) To prepare the Research Reserve officer for his probable wartime billet.

To my mind this last purpose should be the primary one. The purpose of the program should not be merely to maintain interest nor should it be merely a source of points for retirement or promotion. These incentives will attract only the weakest elements of the units. Primary emphasis should not be placed on either the social or conventional scientific side. If a strong training program is established to prepare the Research Reserve officer for his probable wartime billet, beneficial secondary effects will follow automatically.

Next let us consider what the probable wartime billets of these officers will be. These cannot be predicted with certainty because of the present uncertainty in the Department of Defense of how science and scientists will be mobilized in the event of war. Furthermore, we cannot predict how and when war may come. However, I believe we can safely make the assumption that most of the Research Reserve officers would occupy one of the four following types of billets:

(1) Liaison officer between operational groups, CNO, the Fleet, the Army, the Air Force, and laboratories both government and civilian.

(2) Project officer charged with the direction or administration of specific tasks.

(3) Staff position on commands on shore and afloat.

(4) Active prosecution of military research and development in government and other laboratories.

When we rule out certain purposes as primary objectives, such as a training program which would serve as a sort of WPA for points, and emphasize preparation for specific wartime billets the problem of an appropriate training program becomes much clearer.

Since the units are entitled Research Reserve Units, it is natural that the possibility of actually performing research be considered as a possible activity. A certain amount of healthy competition is desirable between the laboratories of ONR, the University Program of the Research Divisions, and the Research Reserve Units. But it is essential that we eliminate the possibility of strong conflicts among these groups. Thus, it seems that the type of research in the University Program which we might term conventional research is thus automatically ruled out of the Research Reserve program. There are other reasons for not considering this conventional research. It does not directly contribute to the primary objective of preparing the Research Reserve officer for his probable wartime billet. A conventional research program does not take advantage of the many special opportunities and privileges which the members of the Research Reserve have as members of a military organization.

First let me say that a healthy training program should not contemplate any substitutes for the bi-monthly meetings. I feel that their continuance is a necessity if we are to build a strong team spirit. The units should be encouraged to vary the meetings in such a way as to secure more audience interest and participation. One variety is through forums or round table discussions on timely and provocative subjects, such as:

(a) Mobilization of Science in Time of War,

(b) Research and National Security,

(c) Mobilization of Industry in Time of War,

(d) Atomic Energy Control,

(e) What is the optimum loyalty program considering the apparent conflict between the rights of civil liberties and the requirements of national security,

(f) Means for improving unification,

(g) Mobilization of military laboratories.

There are several possibilities of other activities which members of the Research Reserve units might engage in. Consideration should be given to approving these activities as appropriate duty. Thus retire-

ment points could be awarded upon the successful completion of specific tasks.

The first of these has to do with the preparation of Supplemental Summary Technical Reports. Almost a year before the end of hostilities, Dr. Bush, the Director of the Office of Scientific Research and Development, realized the necessity for the preparation and publication of reports on the part of OSRD and NDRC in the war effort. Summary Technical Reports were prepared corresponding to the 19 divisions, two panels and two committees. The Summary Technical Report of each division, panel or committee is an integral survey of the work of that group. The first volume of each group's report contains a summary of the report stating the problems presented and the philosophy of attacking them. A summary is made of the results of the research, development and training activities undertaken.

There is a great variation in the type of material in the reports. Some volumes are treatises on the state of the art. Others contain descriptions of devices developed in the laboratories.

A complete set of the STRs consists of 68 STR volumes and two index volumes. While not a complete encyclopedia on weaponry, it covers in a broad way almost every scientific discipline with military interests. In addition, there are 28 volumes of unclassified work in the Radiation Laboratory series.

Since the end of hostilities, the National Military Establishment has spent over two billion dollars on military research and development. Many of the gaps indicated in the Summary Technical Reports are being filled and much of the work recommended is well underway.

A most useful and valuable activity of the Research Reserve would be the preparation of supplemental reports to these Summary Technical Reports. This could be done the following way: Individuals or small groups of individuals under the Research Reserve would indicate a desire to bring a volume, or part of a volume, in the Summary Technical Report series up to date. Using the selected material as terms of reference and as defining the boundaries of the particular technical area being reviewed, they would first of all study the material in the STRs together with the suggested bibliography. Following this they would examine reports issued since the war in this field. A supplemental report summarizing advances since the preparation of the STR would be prepared. These supplemental summaries would be studied in the appropriate branch of ONR and would be reviewed by the interested Bureau or Agency. Material would be returned to the initiating group with revisions and suggestions. A corrected summary would be prepared, which again would be carefully screened. When general agreement had been reached regarding the quality and accuracy of the supplemental summary report, the material might be published using the form and typography of the STRs. Published volumes would be distributed to interested agencies in the Department of Defense. In this way the Research Reserve would make continual contributions to an expanding and up-to-date weapon encyclopedia.

Through the Library of Congress contract, ONR could offer great assistance to the authors. Eventually there might be several people in

the Library of Congress, and perhaps an editor in ONR Washington, devoting full time to this activity.

A glance at the Summary Technical Reports quickly indicates that there is no upper limit to the technical level of the material. On the other hand, the viewpoint is always that of practical military considerations.

The security classification of the STRs varies all the way from unclassified up to and including secret. The groups preparing supplementary material could not of course take an area the classification of which was beyond that of their local physical security facilities.

Another type of activity might be the undertaking of Special Projects by a unit or group of individuals within a unit. Recently the New York City Research Reserve Unit made a critical attitude survey of its own members. The unit is preparing a proposal to extend this attitude survey to other Research Reserve units.

The organization of Instructional Seminars furnishes another possibility. The Research Reserve Unit at Oak Ridge organized and prepared a program for a two-week nuclear science seminar. This seminar was attended by over fifty officers from other Research Reserve units.

The Preparation of Special Correspondence Courses for members of the Naval Reserve would also come under the classification of appropriate duty.

Finally, I would like to include as a possibility, Special Study Programs of which I will mention just one.

Operations Research Training. During the last year, the term "Operations Research" was used to describe scientific and quantitative studies of the operations of war. The exact nature of this work cannot be accurately defined. However, it is possible to estimate where operations research merges into engineering and development work. In this way it is possible to broadly define the limits within which an operations research group works.

The main function of an operations research group is to analyze actual operations using the data to be found in such material as action reports, track charts, dispatches, and intelligence summaries from actual interviews. The military operations research worker studies weapons and equipment from the user point of view. He is not a statistician. Statistical analysis is one of the many scientific tools he uses in his analytical task.

I would like to emphasize that a very important difference between operations research and other scientific work is the immediate sense of urgency involved. It is often necessary to make a preliminary analysis on very incomplete data because crucial decisions cannot be delayed while an exhaustive study is made. Thus the operations research worker must exercise most careful judgment in evaluating the data available and squeezing the utmost use out of it. There is a great need for more people familiar with the methods and general philosophy of this important work.

The methods of operations research are applicable to many peacetime as well as wartime problems. An example is the routing of traffic at various times of the day.

A very appropriate activity of a group within a Research Reserve unit might be an intensive study of the methods and procedures of operations research. Later these methods and procedures might be applied to a specific task within the group's community. These tasks might or might not be military.

Suitable study material is available in a number of the OSRD Summary Technical Reports. One of these "Operations Research Methods," OEG report No. 54, has recently been declassified. I believe that this book will be available for general distribution in a very short time.

In conclusion, I would like to point out that ONR has a new and very rapidly growing activity. The Naval Volunteer Research Reserve Units can be exceedingly valuable to the Navy and to the nation. They have brought with them a number of problems, the most important of which is an appropriate peacetime training program. I hope that your Committee will give careful consideration to appointing a small group to study these problems and help make the Volunteer Naval Research Reserve one of the strongest activities of the Office of Naval Research and the Department of Defense.

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U. S. GOVERNMENT PRINTING OFFICE : O—1950