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SUMMARY OF RESEARCH PROGRESS MEETINGS OF JANUARY 8, 22, 29, AND FEBRUARY 5, 1953

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March 13, 1953

Berkeley, California

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Meeting of January 8, 1953

I. Pasadena Meeting of American Physical Society. Steve White

Dr. Steve White of UCRL-Livermore Site spoke about his experiences while attending the Pasadena part of the Inyokern-Pasadena meeting of the American Physical Society, held December 26, 27, 29 and 30. The papers mentioned and discussed in particular at the UCRL Progress Meeting were the invited papers entitled, "Recent Experimental Evidence Concerning V^0 Particles" by R. B. Leighton and "The California Institute of Technology Synchrotron" by R. V. Langmuir; as well as a post-deadline contributed paper on the subject of photoproduction of π^0's from hydrogen by W. C. Walker, et al. No doubt, the abstracts of these papers will appear in the publication of that society, "The Physical Review".

II. Problems of Underwater Swimming. Hugh Bradner

Interest in underwater swimming is being revived particularly in connection with the problems of training of "frogmen" in the military program. During World War II the Italians started quite an impetus for this activity as a result of an impressive record of 225,000 tons of military shipping destroyed by swimmers using compressed bottles strapped to their backs. The British devised a system using tiny submarines which were successful in sinking the German ship "Tirpitz". At present the underwater training program is a crucial part of amphibious warfare and the U. S. Navy is intent on going as far as possible in exploiting its possibilities and in overcoming the numerous inherent limitations.

From the purely physiological aspect of the human body some of the problems encountered with underwater swimming are as follows:

1. Nitrogen narcosis. Here the swimmer becomes somewhat "drunk" and actually can not trust his reasoning and mental efficiency.
2. "Bends". This is caused by coming up too fast and is due to nitrogen evolution from tissues into the blood upon release of external pressure.
3. Oxygen poisoning. With prolonged breathing of oxygen the body acquires twitches and eventually convulsions in various degrees.
4. Ear trouble, due to slow equalization of pressure in the inner ear. Usually the depths for this trouble are at 30 feet and again at 100 feet.

Some of the mechanical problems involved are:

1. Oxygen supply and the rebreathing apparatus. In order to avoid anoxia there must be positive assurance of oxygen flow in the breathing bag; this is a real problem and as yet not solved satisfactorily. Extensive research is being conducted with various rebreather mechanisms; such as hyperoxide units, dumbbells using the paramagnetism of oxygen, diffusion pressure systems and constant flow of O and N with a needle valve or porous plug.
2. Body warmth. The diving suits are not satisfactory for operation in cold water. They pinch and chafe at depths beyond about ten feet. Also, they rip easily and thus lose their insulation.
3. Communications. There is a definite need for a system of intercommunication or a means of signaling between members of a group or between swimmers and the ship or submarine. An underwater mission is practically useless if reconnaissance

information can not be transmitted back to the control center as is the case where a swimmer fails to return even though having reached his destination. At very short range for a small group it is possible to talk through the face plate on a buddy system, but for a team of twelve or more this is quite impractical.

4. Propulsion. Various proposals have been offered for propelling an individual underwater, as for example, a possible compressed air expansion motor. This could greatly increase the operating range by relieving the energy required from the use of leg muscles.

There has been very little work done as yet with underwater photography. A French team under Cousteau has produced perhaps the best film in this respect in connection with salvaging of old sunken galleons discovered in the Mediterranean. The film does a very good job of showing the type of diving equipment used and its operation under water. The photography is remarkably good and one is able to study the amount of facility and ease of operation of individual swimmers and of groups during their progress through the sunken ships, around underwater cliffs and along the sea bottom, encountering various marine life as octopuses, turtles, fish, etc.

Meetings of January 22 and 29, 1953

I. Third Annual Conference on High Energy Physics, University of Rochester, December 18, 19 and 20, 1953. Lynn Stevenson and O. Chamberlain

At the progress meeting of January 22, 1953, Lynn Stevenson discussed various theoretical and experimental papers which had been presented at the high energy physics conference. Particularly noted were the following: Christy on the subject of isotopic spin and the symmetrical theory; Pais's discussion of Lévy's work on the repulsive core and the derivation of a split region; Rainwater's experiment on monoenergetic mu mesons; and, Goldwasser and Bernardini's results on the reaction $\gamma + p \rightarrow \pi^+$.

At the meeting of January 29, 1953, O. Chamberlain discussed in some detail the theory of saturation of nuclear forces as described by Weisskopf and the theory of the repulsive core by Levy. Also discussed was Fermi's work on meson scattering.

Meeting of February 5, 1953

I. Secondary Particles Resulting from 375 Mev Alpha Bombardment. R. W. Deutsch

The talk has been summarized in an abstract report UCRL-1975 entitled "Secondary Particles Induced by 375 Mev Alpha Particles" by R. W. Deutsch and W. H. Barkas. It is quoted as follows:

> "Thin targets of Be, Al, Ni, Ag, Au and U have been bombarded by an internal cyclotron beam of 375 Mev Alpha particles. Secondary particles emerging from the disintegration of the nuclei are detected in Ilford C2 nuclear track plates located beneath the median plane of the cyclotron. There are three specific positions for the nuclear plates corresponding to mean proton energies of about 5, 10 and 20 Mev. A secondary particle is identified by measurement of its radius of curvature, range and specific ionization. The light secondaries including H^1, H^2, H^3, He^3 and He^4 fall on identifiable loci. Heavier fragments are also identified by taking into account electron pickup. Relative abundances of the secondary particles and momentum spectra are obtained."

II. Spectrum of Particles Emitted from a Thin Pb Target when Bombarded by 32 Mev Protons. George Igo

This talk, too, has been summarized in an abstract report, UCRL-1994 entitled "Spectrum of Particles from Lead Bombarded by 32 Mev Protons" by Robert M. Eisberg and George J. Igo. It is quoted as follows:

"The inelastic and elastic particles scattered from lead when bombarded with 32 Mev protons were observed at 90° to the incident beam. Particles were detected in a telescope consisting of a proportional counter in coincidence with a sodium iodide scintillation counter. The energy of the particles was determined by pulse height analysis on the scintillation counter pulses. The coincident proportional counter measurement of ionization insured that the particles counted in the scintillation counter were heavy and charged. The observed energy spectrum does not appear to agree with that predicted by the Weisskopf "boil off" theory in that there are too many high energy particles."