physics and biology. To obtain complete mastery of all three is hopeless. We must ask the tolerance of our fellow-specialists in other fields and not hesitate to admit our limitations. It is through our discussions with them, as well as through our reading, that we can avoid the pitfalls of naïveté. I don't see how one divorces scientific fields without retarding progress toward understanding.

Physicists have a somewhat different philosophy of instrumentation than do most biologists. Their fields of inquiry generally require the development of new instruments for particular investigations, and often this requires years of effort before the imaginative return can be garnered. Frequently biologists interpret this as a primary interest in instrumentation. For the good physicist this is just as fatal as in any other field of research. He has simply become accustomed to a greater demand on his patience and perseverance. He must command different fields of technology to accomplish his research. Gadgeteering as an objective spells the end of research. If biologists are to encourage physicists to take up biophysics, they must avoid demanding too much technological assistance and must help the physicist acquire biological familiarity and perspective. The physicist must be prepared to do a great amount of reading and laboratory work before he can claim to be a biophysicist.

Biophysics differs from the biological fields on which it may impinge simply in:

1. The more advanced physical concepts that may be brought into play.
2. The kinds of information on mechanism that may be sought.
3. The background of interpretation which can be drawn upon.
4. The kinds of analysis employed.
5. The development of new approaches derived from a different experience.

It requires just as much biological perspective, judgment, and factual knowledge.

To Dr. Alexander I would say that those of us who have entered biological research from physics need your help, encouragement, and guidance through our fledgling stage; we do have something besides instrumentation to offer biological research.

To Dr. Stacey I would suggest that we must not let enthusiasm be interpreted as presumptuousness. In whatever field of biology the biophysicist undertakes research, he must win his spurs. He cannot afford to be a physicist among physiologists and a physiologist among physicists.

Probably for certain purposes we have to be classified and put into pigeonholes, but let's not allow this zeal to prejudice our relationships, limit our interests, or cramp our thinking. The standards of good research are universal.

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Technical Papers

Source of Atmospheric Salts

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Evidence at the present time points to the importance of the sea as a primary source of hygroscopic salts in the atmospheric condensation process (*1–3*). These air-borne microscopic particles of salt are the universal condensation nuclei in the formation of rain, fog, and snow. Wind-borne salt spray has also been shown to be responsible for the zonation and spray forms of coastal vegetation (*4–6*). And the main source of soil iodine, absolutely essential in human nutrition, is wind-borne salt spray from the sea (*7*).

The exact source of these salts from the ocean has never been discovered, at least as far as the author was able to determine from literature reviews. Kohler (*1*) assumed that by some selective process salt particles or droplets of one particular size are driven from the sea. In his discussion of the composition of the atmosphere, Clark (*8*) states, "The figures for atmospheric chloride are even more surprising; but they represent in general salt raised by vapor from the ocean." Jacobs (*2*) suggested that the breaking of waves on the shore and the bursting of bubbles produced aerosols by the mechanical dispersion of the liquid. Stuhlman (*9*) has investigated the dispersion of tiny droplets in a gaseous atmosphere by the bursting of small bubbles. In water, bursting bubbles between 0.8 and 2.0 mm in diameter ejected more droplets to a greater height (14 cm) than bubbles either above or below this range. It was also shown that a smaller number of larger drops is projected to lesser heights as the size of the bursting bubble increases, and that the number and height of droplets projected plotted against the size of the bursting bubbles formed a Maxwellian-type curve.

During a study of the coastal vegetation of Brunswick County, N. C., the author had the opportunity to investigate this phenomenon. The first measurements of the landward movement of salts were made with cheesecloth salt traps (*6*). And, as previously shown, there was a decrease in salt concentration with distance from the ocean. However, it is significant that with a wind velocity of 4–6 km/hr, an average of 2.3 mg of salt/dm^2 of cheesecloth was measured in 8 hr at 270 m from the ocean. This led to an investigation of the dispersion of very tiny droplets into the atmosphere.

Since the cheesecloth traps did not give a measure of the relative size or number of droplets, a salt-sensitive paper was developed. Filter paper, of the 9-cm size, was dipped in 0.01 *N* K_2CrO_4 and air-dried. The dried paper was then dipped in 0.02 *N* $AgNO_3$, subsequently in distilled water to remove the excess $AgNO_3$, and redried. When droplets of sea water fell on the paper, light-yellow spots were formed by the chemical action between Ag_2CrO_4 and the halides of the sea water. The size of the spots is a relative measure of the size of the droplets, but is not a measure of the actual size of the droplets at the moment of impingement on the paper. For comparison of quantitative amounts of salt at each station, the paper was standardized by titration of samples with a known solution of NaCl. The difference between the titration value of the standardized samples and that of the exposed paper was taken as an indication of the quantity of salt caught at each station.

When the salt-sensitive paper was held above the oscillating swash between the breaking waves and the strand, it was almost immediately covered with small spots. These ranged from 4 mm in diameter to barely perceptible dots. When the paper was held above, or just in front of, a breaking wave the spots ranged from 4 to 20 mm in diameter and rarely showed evidence of small dots. It is then immediately apparent that the breaking waves do not disperse an appreciable number of tiny droplets into the atmosphere. It was thought, however, that the tiny droplets ejected into the air by the bursting bubbles of the swash and spume were small enough to be carried by the winds.

By using the oiled glass–slide method of Houghton and Radford (*10*), diameter measurements of air-borne droplets showed a range of 5–200 μ. The means of four determinations, totaling about 800 droplets, were between 35 μ and 55 μ. These droplets are well within the range of fog particles and are therefore easily transported by wind. When the frequencies of these droplets were plotted against diameters, Maxwellian-type curves similar to those of Stuhlman (*9*) were formed. This is considered to be further evidence that the majority of the air-borne droplets originated from bursting bubbles.

To obtain an indication of the area where the greatest quantity of salt became wind-borne, stations were located 5 m apart from the upper strand to beyond the breaking waves. Standardized salt-sensitive paper was thumbtacked to wooden stakes at a height of 50 cm above the strand and the water. Observations were made with a landward wind of 4–6 km/hr and with an outgoing tide.

The papers beyond the breaking waves showed negligible evidence of spray. One paper, when examined under 12-power magnification, showed several dots less than 0.5 mm in diameter. Above and immediately in front of the breaking waves, spots 4–20 mm were formed, with only an occasional dot less than 1 mm in diameter. Above the bursting bubbles of the swash numerous dots were formed, ranging up to 2 mm in diameter, with a mean of about 1 mm. Papers on the strand, 12 m from the highest edge of the water, showed the highest number of dots, but these were somewhat smaller than those of the swash.

Titration with NaCl did not show a significant difference in salt concentration between papers of the strand and those of the swash. This is possibly due to the larger number of smaller droplets caught on the strand. Those above the breaking waves showed the highest salt concentration because of large droplets being pitched by the breaking force of the waves. These droplets are considered to be too large to become air-borne and therefore do not contribute appreciably to atmospheric salts. The papers beyond the waves did not show a perceptible amount of salt. This does not mean that salts become air-borne only over the swash. It is evident that other disturbances on the open ocean which form small, bursting bubbles, such as foam produced by the wake of ships and whitecaps, would also be a source of atmospheric salts.

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Eosinopenic Response of Adrenalectomized Mice to a Cutaneous Application of Cortisone

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Recent experiments have strongly indicated that the eosinopenia occurring over a 4-hr period is a specific response to adrenal cortical hormones. Certain strains of mice have been found to be extremely sensitive to these hormones and have been utilized in a procedure for assaying the 11-oxycorticosteroids (*1–4*). The eosinopenia is produced following subcutaneous, intramuscular, and intraperitoneal injections, as well as oral administration.

The reports of Baker and Whitaker (*5*) and Castor and Baker (*6*) indicated that cortisone produces a local action on the epidermis and connective tissue when applied cutaneously. It became of interest to ascertain whether this method of application also affected the eosinophils. The following report presents

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