



Penguins

► WITH NOT MUCH else to look at except ice, snow and each other, the men of Admiral Byrd's new expedition to Little America will undoubtedly pay a lot of attention to those dapper permanent residents of the Antarctic, the penguins.

It will not take a great stretch of imagination for the explorers to think of these birds as almost human companions. In the first place, the penguin's peculiar upright position and waddling gait bring to mind a tiny man.

This idea gains weight and color by the bird's close-fitting plumage: dark on the back, resembling a formal jacket; and a bright white "shirt" at his breast.

Structurally, the penguin is a bird. Yet by habit he might seem more fish than fowl, since he is flightless and can swim on and beneath the water with great speed. His food consists chiefly of fish caught as he "flies" through the frigid water by beating with his fin-like wings.

In still another sense, the penguin is something of a reptile beneath his fine feathers.

Scientists often consider all birds as a sort of "modified reptile," very closely allied to those cold-blooded animals in the evolutionary picture. Also, there is a generally accepted "law" in biology that the embryonic development of an individual follows in "shorthand" form the evolutionary history of the species. Thus, bird embryos should resemble those of reptiles in many respects—and they do. Furthermore, the closer the resemblance, probably the closer the relationship.

In an experiment, a series of 16 Emperor penguin embryos studied indicated that the early stages of penguin development resemble reptilian embryos of similar age more than chick embryos do. Thus, it seems that the penguin is more primitive and closer to the reptiles than his less elegantly-dressed cousin, the chick.

Incidentally, if you see pictures of penguins and Santa Claus together, something is wrong: Santa lives in the north; penguins are found only in the Southern Hemisphere.

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Spirit of Science

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For if you once do this the lights will go out, and the joy of the work, as well as its ultimate value, will be seriously impaired. And if you ever need to argue against those who claim that it is not possible to be a detached investigator and still have your work of practical value, you can always take comfort in the fact that though the paradox is of unrivaled intensity today, it is far from new.

There are precedents to cite from the most ancient and honorable times, as well as from our own immediate day.

There was a school of philosophers in Europe, once, in the fourteenth century, which included two famous writers, Jean Buridan, and Nicholas of Oresme. They taught some strange, new and outlandish doctrines concerning the nature of impetus, and established a school at the University of Paris. Erasmus laughed their Parisian disciples to scorn for their notions of "uniform motion" and "difform motion" and even—to Erasmus' extreme amusement—"uniform difform motion." But it happened that when the more scientific world of a later day was looking for a formula to represent the acceleration of falling bodies, the solution was already at hand in that much-ridiculed mediaeval formula for "uniform difform motion."

The gap between investigation and use was shorter in the case of the mathematics of matrices which, as you recall, were well developed, for no practical purpose at all, in the nineteenth century, to be ready at hand in the twentieth to make possible those modern concepts of the physical world that dominate our thinking today.

And it is not to be forgotten that essen-

tially every new technical principle that gave rise to decisive armaments in World War II, including nuclear weapons, was originally conceived in research directed to non-practical investigational ends.

Perhaps you will bear with me if I sum up this message once again, reiterative as it seems, because I am so sure that it is important.

You will have to live—and live earnestly—one of the greatest paradoxes that any profession has been called on to surmount. Your practical services will be immensely important, and you must give great attention to them. But you must never forget than the real roots, the real life and joy and reason for being of the scientific profession lie in quite a different sphere.

Unless the excitement and the spiritual satisfaction of the investigator remain the overriding goal, unless they are nurtured and watered and cultivated at every turn, neither the spirit nor the practical competence of the scientific endeavor can be maintained.

This is the real invariant.

It is today still as it was phrased by a Japanese sage half a world away in space and centuries removed in time, when he wrote in paraphrase, "Do not try to *do* what your predecessors did; rather, *seek what they sought.*"

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Questions

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