girls. I am not sure why Ingle ignores the multitude of settlement houses and similar organizations as well as massive anti-poverty measures which are being taken by federal, state, and local agencies. He has a special admiration for 4-H clubs, which abound in rural areas. Of course in the rural area where Negroes are numerous, namely in the South, 4-H clubs are segregated. Slum clearance, while highly desirable, has been found to serve mainly as a morale booster. It does not cure social ills.

Ingle's final solution seems to be conception control, not for economic reasons, but to prevent reproduction by those "unqualified for parenthood." The implications of this proposal are political and moral. Ingle would evidently choose to risk a Brave New World rather than to live with the imperfections inherent in a democracy. I would not. To me, individual freedom is sacred. We do spend billions of dollars on crime, delinquency, and similar social ills. If the only alternative to this is to establish a board of judges to decide who is and who is not fit for parenthood, and thus to sacrifice the very heart of our freedom, then I consider these billions of dollars money well spent.

Science is inextricably bound to philosophy and politics. It is no accident that many nuclear physicists have become moral leaders. In our age, when science is both monstrous and wonderful, it is frightening to see among its ranks men such as Ingle, who lack political insight and philosophical discipline.

ADAM C. POWELL
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Congress of the United States,
Washington, D.C.

I invite interested readers to examine my essay on "Racial differences and the future" for evidence that it was "fraught with emotion" and to examine Powell's letter for its relevance to the questions raised by me about biological problems.

Although the concept of equality is not meaningful in biology, I cherish the ideal of equal rights and opportunity for self-fulfillment which extends beyond the opportunity to make material gains to the achievement of dignity and self-respect. The idea that individualization of education aims for equality in achievement is pure demagoguery. Where have we heard it before? I remember: "Every man a king."

Intelligence ranges from idiot to genius among whites, Negroes, and other "races"; and objective tests, imperfect as they are, are sufficiently good to identify the general level of aptitudes and intelligence in individuals. In most cases, it serves the best interests of the child to teach and train him according to aptitudes, interests, and drives.

I have never characterized an ethnic group as "inferior" or "superior." These terms can be meaningfully applied only to individuals. Although it is proper to refer to a genius as being superior in intelligence and a moron as being inferior in intelligence, these terms also connote human value, something that I do not wish to define in terms of intelligence. We would avoid some trouble and misunderstanding by keeping the words "inferior" and "superior" out of debates about average genetic differences among "races."

Contrariwise, and in apparent disagreement with Powell's concept of equality, I recognize differences in human values; the values of what men make of themselves range from the criminal and law evader to the saint, from the demagogue to the statesman, from the indolent to the worker, from the rake to the virtuous, from the lout to the gentleman. Judgment of human worth is necessary in a democracy. Shall America accede to those aggressive minorities who cry, "I am equal, give to me according to my wants?" Powell accepts the idea of revolution with conflict aimed at the forcing of integration. He does not admit that the behavior of the average Negro is a critical barrier to integration. He is not willing to guide integration according to individuality but asks that all participate as "equals." I hope for voluntary integration linked with an attack upon the reasons that it is resisted. Racial bias is one. Although larger numbers of Negroes are good neighbors, schoolmates, and employees, many are not. One cause of undesirable behavior is the cultural heritage of the average Negro. If average genetic differences are an important basis of Negro problems, we should have this information to use in guiding Negro advancement.

Powell does not grasp the meaning of my proposal that we aim to prevent the transfer of substandard culture by intensive attention to the child from birth or, better still, beginning with adequate prenatal care. The social measures presently practiced are palliative and feeble. This is one area in which we can learn something from the Soviet Union—without emulating their political aims.

Powell is among those opposed to conception control, even among individuals unqualified for parenthood. (Some of the readers who are not biologists equate conception control with sterilization. The term "birth control" is commonly used, although none of the procedures has anything to do with the process of birth.) Many of the biologically and culturally disadvantaged mate only for pleasure and not for reproduction but lack knowledge of how to control conception. Those imperfections which the Congressman says we should keep in our society are the biological bases of human misery.

Although I hope for the evolution of knowledge and wisdom that will make possible a program of eugenics, I have not imagined that science and society are ready to undertake more than simple educational and advisory programs.

The knowledge of mind and body which we should seek and the methods of preventing human misery which we should debate and test by pilot studies could serve the advancement of all races and especially Negroes. We will not move ahead by saying, "Don't look, don't look, this issue is closed." It is my opinion that if America is guided by Congressman Powell, the role of government in education and social reform will impede rather than facilitate progress, and the Negro ghetto will continue to exist until some of the Negro leaders who are great and wise seek knowledge and truth as the way to freedom.

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Astrometry Overlooked

In the National Academy of Sciences report *Ground-Based Astronomy: A 10-Year Program* (see News and Comment, 13 Nov., p. 899), it appears that the panel of authors has overlooked a basic branch of "ground-based astronomy," namely, astrometry. I refer to all facets of astrometry: transit instruments, astrographs, double-star instrumentation, parallax instrumentation, and so forth. It is this branch of astronomy that provides all the positions, motions, and distances that are needed in developing the relations between the kinematical and the physical properties of the stars. Unfortunately, astrometry,

once prominent, has been sadly neglected in recent years by astronomers in this country. The need for research in instrumentation in this branch of astronomy is as great as in any other. It should have been included with radio astronomy and astrophysics in the statement of requirements prepared by the National Academy.

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Exams: The College Boards in Chemistry

In his letter (25 Sept., p. 1385) discussing the relation of the College Entrance Examination Board to various curriculum studies, Frank Fornoff says, "In chemistry and biology, studies made to date have not demonstrated the necessity for special tests for the new curricula." This statement may leave the reader with the false impression that CEEB *in its present state* adequately measures performance of students who have taken the new courses.

In a study made by Educational Testing Service of the 1962–63 administration of the CEEB exam, it was found that students in the two new chemistry curricula (CBA and CHEM Study) had an average handicap of 32.7 and 40.7 points, respectively. This is not surprising when one compares the content and emphasis of each of these new courses with those of the CEEB exam. We understand that the content of the exam is evolving, but that there is a 3- to 5-year lag between the writing of questions and their appearance on the final form of the exam.

It seems doubtful that a conclusive answer will ever be found to the question of whether or not any single examination can adequately measure students' performance in a variety of kinds of high school chemistry courses. Perhaps a more useful question is whether or not such an exam can accomplish its purpose of predicting success in college courses. Diversity in freshman college courses makes this question hard to answer quantitatively. Data are being gathered in freshman courses in a dozen colleges and universities this year in order to compare the performances of students who took CHEM Study courses with those of students who had other kinds of chemistry courses in secondary school. There is already strong evidence that CHEM Study students fare better in their freshman courses at Berkeley than their conventionally trained peers. If this proves to be generally true despite lower scores on the CEEB exam, then the validity of that exam must be questioned. Results of the survey will be available in about a year.

No matter how these questions are eventually answered, the present widespread use of an exam which handicaps CHEM Study and CBA students is presumably having two deleterious effects. One is to deter some school systems and teachers from either adopting the new approaches or giving emphasis in their own courses to up-to-date treatment of principles not covered on the examination. The second is that some students who take the exams and are handicapped on it may indeed be put at a disadvantage in a competitive scramble to get into certain colleges. Both ETS and CHEM Study have taken measures to try to prevent these things from happening, but there is no way of knowing how effective the measures have been. The unhappy fact remains that, stated intentions of the CEEB notwithstanding, the exam is accepted by many as an absolute standard and, so accepted, tends to inhibit needed change in high school course content and to penalize well-prepared students unfairly.

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Who Proved Galileo Right?

In his letter concerning Galileo and the Church (20 Nov., p. 998), Michael Holt remarks that "the world had to wait two centuries" (after Galileo's trial) for the discovery of stellar parallax, which by strong implication is represented as the first satisfactory observational proof of the orbital motion of the earth. The world had, in fact, to wait only about one century for an observational development which no scientist then or now long hesitated to accept as a demonstration of the earth's orbital motion fully as satisfactory as the detection of stellar parallaxes: the (admittedly unexpected) discovery of stellar aberration by Bradley in 1727, more than a hundred years before Bessel published his first reliable parallax.

The point just made is not altogether trivial in the midst of discussions about authoritarianism, in view of the tardiness of the *Index* (1835?) in reconciling itself fully to the Copernican system. Perhaps more interesting, however, is the variation in opinion on the character of "proof," as evidenced by Holt's desire, on the one hand, for the observational detection of stellar parallax (how embarrassing had the distances of the stars been still greater than they are!) and Father Marasigan's willingness, on the other hand (in his letter in the same issue), to accept as proof the analysis of "the observational data of Brahe and Kepler . . . in the light of Newton's law of gravitation," for which the world had only to wait about half a century after the trial. I strongly doubt that Holt or anyone else thinks that modern attitudes concerning the nature of scientific proof were of any great importance at that trial, but I agree that the Church fathers must not bear the entire blame.

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I was surprised to see a letter (20 Nov. 1964, p. 997) citing as an authority the antiquated and highly slanted White, *A History of the Warfare of Science with Theology in Christendom* (published 1895). It is unfortunate that the author of the letter, R. F. McGregor, has not consulted such sources as de Santillana, *The Crime of Galileo* (Chicago, 1955); Drake, *Discoveries and Opinions of Galileo* (Doubleday Anchor, 1957); and Koestler, *The Sleepwalkers* (Macmillan, 1959). Although one may doubt some of their interpretations, their documentation is much more comprehensive than that in the older works.

It is probably too strong to say that Cardinal Bellarmine was a friend of Galileo (see Drake, pp. 74f). But he acted as a friend to science in trying to dissuade Galileo from pushing the Copernican hypothesis onto Paul V (*ibid.*, p. 170; Koestler, pp. 447–449, 453). In this he was joined by other cardinals, Barberini, del Monte, and Galileo's close friend, Dini (Koestler, pp. 445, 446, 454). White's statement is directly contradicted by Bellarmine's certificate to Galileo (*ibid.*, pp. 463, 484; de Santillana, p. 132).